IMPERIAL MYCOLOGICAL INSTITUTE
12 MAR. 1934

BERMUDA

REPORT

of the

DEPARTMENT

of

AGRICULTURE

for the Year

1933

PUBLICATIONS OF DEPARTMENT.

Annual Reports, for 1933 and earlier. Some numbers are out of print.

Agricultural Bulletins will be posted monthly on request.
Back copies may be obtained, if still in print.

Legumes, as Green Manure, by the Director (1915).

Hints on Growing Vegetables, by the Director (1918).

Common Diseases of Horses, Cattle and Swine, by R. L. Tucker, formerly Government Veterinary Officer (1922).

Flower Garden Calendar, Chiefly of Annuals, by Bermuda Garden Club (1927).

Insects of Bermuda, by L. Ogilvie, formerly Plant Pathologist of Department (1928).

Recent Developments in the Marketing of Bermuda Vegetables, by the Director (1932).

Copies of the above may be obtained free on request.

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Board of Agriculture, 1933

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Mr. JAS. H. HOLLIS, Hamilton.

Department of Agriculture, 1933

Director of Agriculture, E. A. MCCALLAN.
Plant Pathologist, T. A. RUSSELL, B.Sc., A.R.C.S., A.I.C.T.A., Dip. Agr. (Cantab.)
Agricultural Assistant, W. R. EVANS.
Horticulturist, J. C. NAUEN.
Inspector of Produce, T. ARTHUR HOLLIS.
Clerk, HILDA C. LINES.

PART-TIME OFFICERS.

Government Veterinary Officer, C. J. COOPER, V.S.

Assistant Inspector of Produce, C. V. EARLY.
Sub-Inspectors of Produce, J. W. M. GIBBONS, E. G. WHITBREAD, A. W. B. FOWLE.

LETTER OF TRANSMISSAL

Agricultural Station,

Paget East, Bermuda.

29th January, 1934.

Sir,

I am directed by the Board of Agriculture to lay before His Excellency the Governor, for the information of the Legislature, the accompanying reports of the Department of Agriculture for the year ended 31st December, 1933.

I have the honour to be,

Sir,

Your obedient servant,

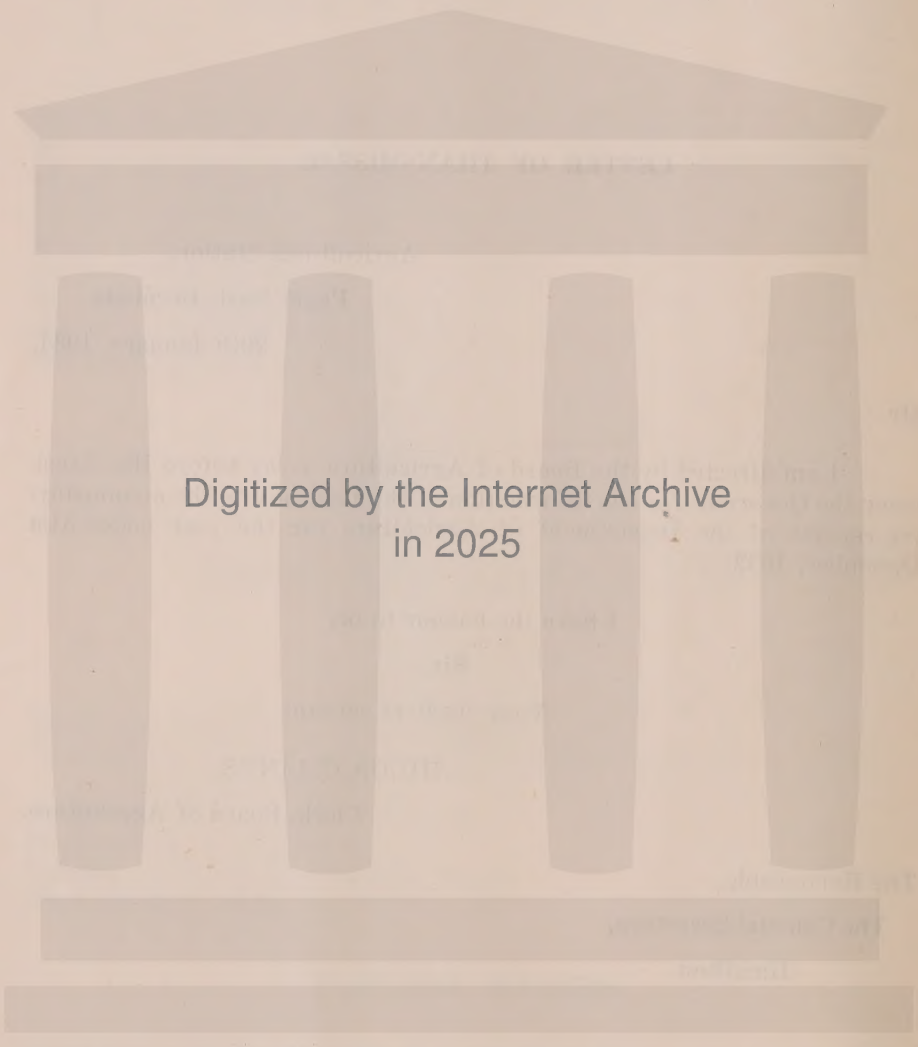
HILDA C. LINES,

Clerk, Board of Agriculture.

The Honourable,

The Colonial Secretary,

Hamilton.



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Report of the Director of Agriculture, 1933

The Chairman,
The Board of Agriculture.

I have the honour to submit herewith reports of the Department of Agriculture for the year 1933.

BERMUDA AGRICULTURE IN 1933.

The year under report was, unhappily, one of low prices for export vegetables, tomatoes being an exception. Nor were low prices the only misfortune, for weather conditions, combined in some cases with neglect on the part of growers to follow effectual control measures, resulted in poor quality in many vegetables. Again tomatoes were the happy exception.

Exports—Quantities and Countries. Following are given the quantities of vegetables and bulbs exported, and the countries to which they were exported:

Commodity	U. K.	Canada	B. W. I.	U. S. A.	Other Countries	Totals
Beans, bushels	—	444	—	—	—	444
Beets, "	—	1,237	—	—	—	1,237
Cabbage, "	—	12,896	—	—	—	12,896
Carrots, "	—	26,005	—	—	—	26,005
Celery, "	—	19,080	—	766	—	19,846
Cucumbers, "	—	533	—	—	—	533
Kale, "	—	—	—	9,294	—	9,294
Onions, "	—	20,890	1,573	20	—	22,483
Potatoes, "	—	14,459	358	29,771	—	44,588
Spinach, "	—	1,618	—	—	—	1,618
Tomatoes "	—	13,852	—	—	—	13,852
Miscellns. "	—	946	—	—	—	946
Totals, bushels	—	111,960	1,931	39,851	—	153,742
Lily bulbs, cases	404	76	—	1,505	29	2,014

The total of vegtables exported is comparable with 172,818 bushels in the preceding year. The total for lily bulbs was 3,009 cases in 1932.

Exports—Value of. The sales and *farm values of agricultural exports were as follows:

Exported to	Sale	*Farm
Canada	£41,900	£24,800
United States	21,500	10,430
United Kingdom	1,160	960
British West Indies	425	280
Other countries	80	55
	£65,060	£36,525

The above totals are comparable respectively with £69,015 and £49,465 in 1932.

Based on farm values and expressed in percentages, agricultural exports were divided among the five markets during the last five years as follows:

	1929	1930	1931	1932	1933
Canada	10.0 %	14.8 %	28.1 %	75.0 %	67.8 %
United States	89.0 %	83.8 %	70.2 %	23.0 %	28.5 %
United Kingdom	.25%	1.1 %	1.4 %	1.7 %	2.6 %
British West Indies	.5 %	.06%	.06%	.2 %	.7 %
Other countries	—	.2 %	.2 %	—	.1 %

Exports—Quantities during last Twenty Years. In Appendix A will be found the quantities of produce exported annually during the last twenty years. The Department has no record of the quantities and values of cut flowers exported.

Produced for Local Consumption. It is estimated that the following quantities and values of locally-produced agricultural products were consumed in the Colony during the year:

	Quantities	Values
Bananas	75,000 bunches	£19,000
Eggs	126,000 doz.	19,000
Milk	2,200,000 quarts	76,000
Pork and other meats	350,000 lbs.	8,500
Potatoes	29,000 bushels	10,000
Vegetables other than potatoes	100,000 bushels	33,000
Bulbs, planting stock	1,000,000 bulbs	3,000
	Total value	£168,500

*Farm value was arrived at by deducting wharfage, ocean and rail freight (when the latter was paid) and marketing charges. The cost of crates and Packing House charges were not deducted.

Agricultural, Products, Annual Values. The estimated annual values of local agricultural products consumed locally and exported during the last five years were as follows:

Year	Consumed locally	Exported	Totals
1929	£191,200	£106,400	£297,600
1930	211,000	104,000	315,000
1931	176,500	35,600	212,100
1932	189,255	49,365	238,600
1933	168,500	36,525	205,025

PACKING OF EXPORT VEGETABLES BY DEPARTMENT

Increase in Quantities Packed. Below is shown, in percentages of total shipments to Canada (exclusive of celery), the quantities packed by the Department:

1931	42%
1932	59%
1933	80%

In 1930, late in the season, the Tomato Packing House (No. 1) was completed, and 1,333 crates were packed.

Below are given in detail the quantities packed by the Department in the last three years:

	1931	1932	1933
Beans, crates	—	203	395
Beets, "	81	926	1,078
Cabbage, "	173	2,281	5,729
Carrots, "	3,067	11,881	21,615
Cucumbers, "	—	183	435
Onions, "	744	9,491	16,299
Potatoes, "	664	4,360	14,368
Spinach, "	—	430	1,555
Tomatoes, "	9,207	24,267	30,956
Miscellaneous, "	32	591	902
Totals	13,968	54,613	93,332

The above figures for 1933 include 2,224 crates packed by the Department, but not shipped under the Colonial Mark, and 1,085 crates shipped to New York.

Southampton Packing House. The shed rented from Mr. Jos. de Moura becoming too small, a temporary shed was erected at the Evans' Bay Railway Station. This building measures one hundred feet long by twenty feet wide, and was completed in February. In March a Boggs onion and potato grader was placed in it. A much larger quantity of vegetables was packed at this centre by the Department than in the previous year as shown over page. This House is not equipped to pack tomatoes, and was not equipped in 1932 for onions and potatoes.

	1932		1933	
Beans	—	crates	108	crates
Beets	153	"	477	"
Cabbage	128	"	944	"
Carrots	2,430	"	8,360	"
Cucumbers	—	"	43	"
Onions	—	"	11,014	"
Potatoes	—	"	5,413	"
Spinach	—	"	171	"
Totals	2,711	crates	26,531	crates

The above figures are included in the quantities already given under "Increase in Quantities Packed."

Enlargement of Packing House Accommodation. In addition to the Packing House at Evans' Bay, Southampton, a second Tomato Packing House was built at the Station, and measures thirty-two feet by seventy-five feet. A 24-bin Cutler grader, gravity conveyors and other equipment were installed. Additional gravity conveyors and other equipment were placed in the main Station Packing House, and a shed measuring thirty feet by twenty feet was built against the south end.

The accommodation added during the year was inadequate, in some respects, to handle the increased quantities of vegetables brought in.

Insurance of Packing Houses. In November the three Government Packing Houses and their contents were insured against fire in the sum of £3,360.

Central Packing House and Pre-Cooling Plant. It is regretted that little progress was made in connection with this essential feature of modern marketing. At the close of the year the subject was again considered, and it is hoped that it will be put through without further loss of time.

Tomatoes held in Cold Storage. To reduce farmers' losses from over-ripening of fruit, tomatoes were received for packing nearly every day during the harvesting period, and after being packed were held in the refrigerated chambers of Messrs. Pearman, Watlington and Co., who gave a special storage rate. The sum of £198. 7. 11. was paid for storage. Examinations of the temperatures of the chambers were made by the Department, which were found to be from 45° to 55°. The longest period during which tomatoes were held was fourteen days (due to insufficient low-temperature space on C. N. S. Lady Drake on 13th June); after a further five days en route to Montreal, the tomatoes were delivered at that market in sound, saleable condition.

Packing House Charges and Supply of Crates. The following Packing House charges were fixed by the Board: Beans, cucumbers, onions, parsley, potatoes and spinach—three pence per crate; beets and carrots—four pence per crate; cabbage and tomatoes—five pence per crate. These charges included grading, packing, making and labelling crates, and cartage to dock from Station Packing Houses; the difference in the rates by rail from Southampton (when compared with rates by cart from Station) were collected from the farmers who used the Evans' Bay Packing House.

The Department was able to secure crate material at very moderate prices, and have the cost collected by the brokers in a manner similar to

that by which Packing House charges, freight and other marketing charges were collected.

It is pointed out that the prices debited farmers for crates, fifteen cents each for tomato lugs and twenty-two cents each for bushel crates, were low in comparison to local prices, and the Packing House charges were nearly all absorbed; in other words, **farmers' vegetables were packed for practically nothing;** and the regular supply of crates to the Packing Houses was in marked contrast to conditions in 1932. At no time in 1933 was the supply of crates insufficient.

Labour Costs. A slight reduction was made in labour costs. In 1931 these stood at 6.50 pence per crate, at 6.08 pence in 1932, and at 5.74 pence in 1933. Had onions been in reasonably clean condition when delivered, the rate would have been still lower; tomatoes were delivered in better condition than in previous years. Making crates, pasting labels, packing tomatoes, and carting to the dock were paid for as piece work, as a rule.

Cost of Packing. The total cost of operating the three Government Packing Houses, exclusive of direction and inspection, was £6,294. 17. 10.

The main items of expenditure follows:

New buildings and machinery	£1,276	7	10	
Packing supplies and contingencies	450	0	8	
Labour	2,234	9	10	
Cartage of crate material	147	15	9	
Cartage of packed vegetables	821	14	6	
Cold storage	198	7	11	
Crate material on hand	1,014	0	0	
Miscellaneous expenditure	152	1	4	£6,294 17 10

Credits.

Charges for packing	£1,574	9	0	
Profit on crates	36	2	6	
Charges on crates	233	0	5	
Cartage from Southampton	229	2	3	
Crate and other material on hand (less 5% depreciation)	1,634	4	10	£3,706 19 0
Nett cost to Government				£2,587 18 10

If the depreciated (10%) value of machinery and buildings purchased and erected during the year (£1,553. 15. 8.) is subtracted from the nett cost above shown, the cost of operating during the season amounts to £1,034. 3. 2. or 2.6 pence per crate. This should be considered a moderate cost.

Farmers' Attitude toward Government Packing. The great increase in the quantities sent to the Government Packing Houses indicate the growing popularity of Government packing. This may be accepted as evidence that, if left to follow their own inclinations and interests, farmers will soon be bringing to the Government Packing Houses practically all their export vegetables.

Receipts were issued for (a) vegetables brought in to be packed, and (b) vegetables packed and delivered at the dock for shipment. The system gave general satisfaction. If some farmers had been more prompt to bring to the notice of the Department errors—either real or imaginary—in their receipts, the few misunderstandings which occurred could have been immediately adjusted or explained.

Some dissatisfaction was again expressed, regarding returnable empties, but was less than in the previous year, for the issue of empties was systematised to some extent. Under the conditions which obtain at the Packing Houses, this irritation can be entirely removed only by honesty on the part of all farmers using the Packing Houses.

SALE OF BERMUDA VEGETABLES IN CANADA

Canada continued to be our most important market. The number of crates exported was larger than in any previous year, but the value was less than in the preceding year.

Exports during the last Five Years. Below are given the quantities exported annually to Canada during the last five years:

	1929	1930	1931	1932	1933
Beans, crates	513	—	—	233	444
Beets, "	752	388	620	1,396	1,237
Cabbage, "	309	687	1,703	3,998	6,448
Carrots, "	11,652	16,841	10,956	17,773	26,005
Celery, "	3,341	8,551	4,453	23,236	9,540
Cucumbers,"	—	—	20	313	533
Onions, "	3,419	10,322	3,360	29,034	20,890
Potatoes, "	512	452	1,763	7,397	14,459
Spinach, "	—	—	20	587	1,618
Tomatoes, "	23,329	19,748	14,700	30,813	41,557
Misc. "	980	122	157	762	928
Totals, Crates	44,807	57,106	37,752	115,542	123,659

Shipments to Each Market. Below are given the shipments (in crates) to each of the three key markets:

	Halifax		Saint John		Montreal		Totals		
	G.P.	F.P.	G.P.	F.P.	G.P.	F.P.	G.P.	F.P.	Totals
Beans	60	...	175	41	160	8	395	49	444
Beets	284	11	387	86	407	62	1,078	159	1,237
Cabbage	2,922	17	1,041	505	1,766	197	5,729	719	6,448
Carrots	6,003	894	8,968	2,292	6,592	1,256	21,563	4,442	26,005
Celery	...	2,666	...	3,559	...	3,335	...	9,540	9,540
Cucumbers	53	19	46	33	336	46	435	98	533
Onions	3,250	802	3,358	3,087	8,604	1,789	15,212	5,678	20,890
Potatoes	1,899	137	1,236	338	10,148	701	13,283	1,176	14,459
Spinach	650	29	819	34	86	...	1,555	63	1,618
Tomatoes	3,652	1,200	4,370	2,819	22,914	6,582	30,956	10,601	41,557
Misc.	243	...	326	15	333	11	902	26	928
Totals	19,036	5,775	20,726	12,789	51,346	13,987	91,108	32,551	123,659

G.P.=Government-packed; F.P.=Farm-packed.

Sales Prices. Below are given the prices at which vegetables were sold in Canada during the last five years:

	1929	1930	1931	1932	1933
Beets, 1-bu. ct.	$1.49	$1.40	$1.42	$1.57	$1.57
Cabbage, 2-bu. ct.	1.96	2.25	1.64	2.33	1.73
Carrots, 1-bu. ct.	1.42	1.39	1.31	1.89	1.43
Celery, 2-bu. ct.	2.51	2.84	2.98	2.74	1.90
Cucumbers, 1-bu. ct.	—	—	—	2.39	1.91
Onions, 1-bu. ct.	1.49	1.12	2.04	1.67	1.06
Potatoes, 1-bu. ct.	1.18	1.97	1.94	1.86	1.75
Spinach, 1-bu. ct.	—	—	—	1.35	.86
Tomatoes, 20-lb. lug.	—	1.19	1.33	1.49	1.61

*__Farm Prices.__ Largely because of the poor quality of some of our vegetables, there was a greater difference between selling prices and farm prices than in former years. The subject is discussed further under "Cost of Selling the Crop."

Below are given farm prices for the last five years. In 1932 the premium on the Canadian dollar was fixed at 17%, for the other years the dollar was taken at par.

	1929	1930	1931	1932	1933
Beans	—	—	—	4/–	2/6
Beets	4/1	3/9	4/2	5/–	4/4½
Cabbage, 2-bu. ct.	5/2½	6/–	4/4	7/6	3/2½
Carrots	3/9½	3/8½	3/9	6/3	3/5
Celery	3/11½	3/6	6/11	8/–	3/3½
Cucumbers	—	—	—	8/11	5/5½
Onions	4/8	3/6	6/11	5/11	2/7
Potatoes	3/2	5/3	6/1	6/3	5/1
Spinach	—	—	—	4/3	1/5½
Tomatoes	—	4/–	4/4	5/5	5/2

If to the 1933 farm value of £24,800 is added £290 paid in Bermuda as wharfage and £2,099 as commission to Bermuda shippers, the local value amounts to £27,189 as compared with £40,347 in 1932.

Cost of Selling the Crop. As already noted, 1933 selling and marketing costs were higher than in the previous year, for in 1932 it had cost an average of one shilling and five pence per crate, and in 1933 the average cost was two shillings and nine pence per crate. This greatly increased cost was largely due to the relatively poor quality of some vegetables, which made it necessary to hold them in cold storage and re-condition them, and the demand for them was dull.

Separation of Government-Packed and Farm-Packed Vegetables. At a joint meeting of the Board and licensed shippers held on 23rd May, by a majority vote it was decided to depart from the policy adopted at a similar joint meeting held on 19th December, 1930, and adhered to since then, namely, to confine shipments to Canada to one selected broker in each of the three key markets.

The decision arrived at by the later meeting was, undoubtedly, largely influenced by low prices in Canada. At the later meeting it was decided to sell Government-packed vegetables and farm-packed through

* See foot-note on page 2.

two Montreal brokers. As the change was made late in the shipping season of all vegetables except tomatoes and as the quantities subsequently shipped—particularly of farm-packed—were very small, a comparison of the sales of tomatoes only can be made.

From 6th June (when the change was made) to 4th July (when the last shipment was made) 28,086 lugs of tomatoes were shipped; of this quantity 21,687 lugs of Government-packed sold at an average price of $1.70, and 6,399 lugs of farm-packed sold at an average price of $1.45. Having regard to the much larger quantities of tomatoes packed on farms subsequent to the change (prior to 6th June only 72 lugs of farm-packed had been shipped to Montreal), and the increased cost to farmers to pack on their respective farms, the change was a costly one, and the majority of farmers are now aware of it.

Canada's Share. It was pointed out by Mr. E. G. Whitbread in the Canada-West Indies Magazine (October) that "for every dollar spent in Canada on Bermuda vegetables, roughly 47 cents was directly employed in providing work for Canadian labour", and in this way:

Crate material	$25,000
Ocean freight	39,000
Rail freight, cold storage, commission etc.	31,000
	$95,000
Gross sales	£95,000

Marketing Officer. The value of a marketing officer in Canada was well illustrated this year. Mr. W. R. Evans was very active in the interests of farmers and shippers. The cost (exclusive of cables and other incidentals) amounted to .8 pence per crate. For information on the subject see the Assistant's report.

Jamaica Conference. Under this caption on page 20 will be found matter bearing closely on sales in Canada.

SALE OF VEGETABLES IN U. S. A.

The rapid decline in agricultural exports to the United States of America is shown below:

	Vegetables, bushels	Bulbs, crates
1929	308,294	5,172
1930	190,353	4,719
1931	85,903	3,659
1932	45,970	2,571
1933	39,851	1,505

Of the quantity exeported in 1933, nearly 30,000 bushels were potatoes, and the remainder was principally kale. Early recovery of the New York market appears improbable.

Farmers of the Colony are indebted to Messrs. Furness Bermuda Line for a reduction of freight from 25 cents to 20 cents on crated potatoes.

EXPORT VEGETABLES.

The chief export vegetables in 1933, named in the order of quantities exported, were potatoes, carrots, onions, celery, tomatoes, cabbage and Portuguese kale.

Information regarding control of diseases and pests will be found in the report of the Plant Pathologist, and marketing information in that of the Agricultural Assistant.

In Appendix A will be found the quantities of vegetables exported annually during the last twenty years.

Potatoes. Though still the most important vegetable export, potato exports declined steadily from 1928 to 1932, and advanced 24 per cent in 1933 when compared with the previous year.

If potato exports to Canada are to increase, Irish Cobblers should be substituted for Garnets, because white-skinned potatoes are much preferred in that market.

In the production of no other crop has the Bermuda farmer better opportunity to reduce the cost of production than of potatoes.

Under "Triumph Seed Potatoes" and in the Assistant's report will be found further information on potatoes.

Carrots. The price of carrots has been maintained at a more uniform level than that of any other export vegetable. The crop is an easy one to grow, but expensive to harvest under existing farm practice. The following conditions should be observed: as wide a rotation as practicable should be followed, the seed should be sown thinly in rows sufficiently wide apart to permit horse cultivation, the land should be deep and but moderately manured, little castor pomace and no nitrate of soda should be applied, and the roots should be moulded to lessen sun-scald.

Until a local pre-cooling plant is provided, shipment of carrots with tops is not advisable, and only such are popular in Upper Canada.

In the Assistant's report will be found information regarding the selection of a suitable type of carrot.

Onions. An inferior crop of onions was reaped. This was partly due to too early planting and partly to disease, and both were aggravated by Teneriffe seed which produced a high proportion of red-skinned bulbs. The Department had strongly advised farmers against too early planting, but the high prices of the preceding two years, $2.04 and $1.67, tempted many to seed very early. The average of the year's prices, $1.06, would have been higher had the crop been of good quality.

In 1925 the Department began to select onion seed. In that year a selection of bulbs of the desired type was made, and sent to Messrs. Aggeler and Musser, seedsmen of Los Angeles, Calif., who returned to the Department most of the seed produced. In each succeeding year a further selection of bulbs has been made in Bermuda, and has been grown by Messrs. Aggeler and Musser. The quantity of seed now being produced from this selection is nearly sufficient for commercial plantings, and local seedsmen are strongly urged to import this seed rather than less dependable strains from Teneriffe.

Celery. Celery exports decreased from 77,947 crates in 1929 to 9,923 crates in 1933. This reduction is due in part to reduced plantings, but also to the presence of blight, which in 1933 very seriously injured the crop, particularly in the central and eastern parishes; timely spraying would have reduced the loss.

By many growers Golden Plume or Wonderful is considered superior to Golden Self-Blanching of M. Clause, the variety which so greatly increased exports from 1925 up to 1929, since when reductions in plantings have taken place. Samples of all seed should be sent to the Station for inspection and treatment.

The Assistant refers to the importation of celery seedlings from Canada.

Tomatoes. Tomatoes promise to become the Colony's most inmportant export vegetable. During the three years 1931 to 1933 exports have risen from 14,700 lugs to 41,557 lugs, an increase of 182 per cent.

By packing tomatoes at the Government Packing Houses the Department has greatly benefitted tomato growers. To a degree not yet reached in respect to other vegetables, Government-packed tomatoes are superior to farm-packed, and command correspondingly higher prices. Farmers were ill advised to pack any of their tomatoes on their farms in 1933, and suffered losses by so doing. The change cost one farmer, so he estimates, £200.

Tomato Sizes. The tomatoes packed by the Department (30,956 lugs) were separated into the following sizes:

Sizes	Number of lugs	Percentage of whole
50's	224	.71
72's	5,371	17.35
98's	16,036	51.81
144's	7,952	25.69
Gems	1,373	4.44

Average rate paid for packing, 2.39 pence.

For purpose of comparison the approximate weights and diameters of fruits are given:

Sizes	Approximate weights	Approximate diameters
50's	6.4 oz.	3.1 inches
72's	4.4 "	2.6 "
98's	3.3 "	2.2 "
144's	2.2 "	1.5 "
Gems	1.8 "	1.5 "

Cabbage. Exports of cabbage have increased from 338 crates in 1929 to 6,448 crates in 1933, but prices obtained in the last-named year were very low. Cabbage is a cheap vegetable, except under unusual conditions in the best of years, and profitable prices can be obtained only for hard, fully-leaved, disease-free heads of the popular type. Charleston Wakefield is the type recommended. A wide rotation should be followed.

Kale. The cultivation and marketing of Portuguese kale or cabbage (Couve Tronchuda) is almost exclusively a family affair, for its cultivation is confined largely to one family in Bermuda who sells it to a relative in New Bedford, Mass. Sales are generally f.o.b., and are moderately profitable. The chief complaint is the small demand, which seldom exceeds 200 crates per week.

Crop Reports. Four reports of export crops were issued. That of 27th February estimated that, in percentages of the previous year's acreages, the following areas were planted: cabbage, 175%; carrots, 141%; celery, 68%; onions, 456%, and tomatoes, 201%.

LILY BULBS

Exports of bulbs of the Bermuda Easter lily (*L. longiflorum* var. *eximium;* trade name, *L. Harrissii)* during the last five years were as follows:

1929	5,864	cases
1930	5,508	"
1931	4,270	"
1932	3,009	"
1933	2,014	"

The decline of exports since 1928 (7,611 cases, the record in recent years) is due almost entirely to the World depression. The number of growers and areas under cultivation during the last five years are given below:

	Growers	Acres
1929	154	58.1
1930	157	62.7
1931	156	56.2
1932	105	44.0
1933	70	33.0

Copy of the report of the Board's London representative, Messrs. Robert Tucker and Co., will be found in Appendix B. It is due to Messrs. Tucker's activity that sales in England have been maintained.

Exports of bulbs during the past twenty years will be found in Appendix A.

DOMESTIC MARKET

As shown on page 6, the estimated value of locally-grown agricultural products was £168,500, a value probably in excess of popular opinion on the subject.

Despite the high value of agricultural products disposed of locally, the sale of these products, particularly of vegetables, is haphazard. Sales, especially to hotels, could be increased, but this would call for a degree of co-operation and co-ordination of interests unknown in the Colony. The subject is one to which the Department has given attention, and has not been backward in giving advice. The principal obstacles to the growth of the industry are (1) lack of business knowledge on the part of most of our farmers, (2) low prices at which foreign agricultural products can be imported, and (3) labour conditions in hotels which give a strong slant towards canned products.

The complete answer to the whole question is an active and efficient farmer's co-operative organization, or—failing that—for the Department to establish a local selling agency. Whatever the method decided on, a low temperature plant will be required. The canning of surplus vegetables is impracticable.

The Farmers' Market in Hamilton has been a valuable aid in the sale of local vegetables and other products, and should be enlarged.

Hard times may cause a return to home gardening, which has declined since the Great War.

DOMESTIC LIVE STOCK

The number of domestic live stock in the Colony is estimated to be as follows:

Horses and other draught animals	1,540
Dairy cattle	1,400
Swine	1,500
Goats	400
Poultry	16,000

Very few horses are bred in Bermuda, but are imported chiefly from Canada and the United States. The majority of dairy cattle are locally bred, and Guernsey grades predominate; the breeding stock at the Station has improved the Colony's cattle. A declining demand for locally-produced pork has reduced the number of pigs kept, which are chiefly Berkshire and Yorkshire grades. Goats are of some value to the cottager and labourer.

The Annual Agricultural Exhibition has been a valuable aid to live stock breeding.

For other information on the subject, see report of the Government Veterinary Officer.

Farmers are urged to give better care to their farm animals and to make greater use of locally produced animal products, particularly milk, eggs and pork. Far too many farm families "live out of tin cans and paper bags."

CONTROL OF PLANT DISEASES AND PESTS

See report of the Plant Pathologist, particularly in respect to the control of diseases and pests of export crops.

The spread westward of the palmetto scale is causing grave concern. The Plant Pathologist is studying the matter closely with the object of introducing a more active parasite.

It is hoped to organise a campaign against the Mediterranean fruit fly in 1934.

TRIUMPH SEED POTATOES

Since 1913 attention has been given to the improvement of seed potatoes. The Department's search for disease-free strains, and its regulations regarding importation have greatly improved the seed sold to farmers, though completely satisfactory seed has not yet been secured. Twenty years ago Maine was the chief source of Triumph seed, and how poor it was may be learned by perusal of the Department's reports of that time. This source failing, seed from Wisconsin, Northern New York, New Brunswick and Nebraska were tried in turn. The seed from Nebraska is vigorous and free from virus diseases when imported direct, and the same may be said of strains from Nova Scotia, Prince Edward Island and New Brunswick.

For the main planting in September the practice of purchasing seed in Long Island, N.Y. (grown from the American sources named) has been continued. Seed from Long Island can be obtained at the time it is required for planting, about 20th of September, but the Island possesses some disadvantages as a source for seed. As the years have passed potatoes have taken the place of other crops on Long Island until they now occur very often, indeed almost without interruption, in the rotation.

Potatoes which follow potatoes are generally infected with leaf-roll through the presence in the fields of volunteer leaf-rolled plants. This source of danger was pointed out to the Department by Dr. K. H. Fernow of the College of Agriculture, Cornell University, and Dr. S. E. A. McCallan of the Boyce Thompson Institute for Plant Research, Inc., Yonkers, N.Y.

In the last two years the Long Island contractors were asked to plant in fields which had not been planted to potatoes the previous year; a condition difficult to fulfil. In 1933 one contractor planted in clean fields, but the other did not. The first lot of seed gave a crop in Bermuda which averaged only 2.3 per cent leaf-roll, and the other averaged 43.4 per cent, though rogued in Long Island. The above are averages of twenty-eight counts made in the Station plots, and are confirmed by many counts made on farms.

To make the situation clearer, it is pointed out that practically clean Nebraska seed was planted in Long Island in 1933; the Long Island crop from this seed showed very little leaf-roll, the average was .07 per cent, and not until the seed was planted in Bermuda was the infection evident, and reduction in the yield followed. The situation is a difficult one to control in Long Island, and perhaps it is outside of the Island that clean Triumph seed can be secured.

For many years Canadian-grown Triumphs have been planted here later than the stocks from Long Island. Since 1926 it has been possible to chemically treat this seed to hasten its germination. In the year named Dr. F. E. Denny of the Boyce Thompson Institute for Plant Research, came to Bermuda at the invitation of the Board to conduct experiments on Nebraska and other seed. The results of this principal experiment and succeeding ones made by the Department showed that northern-grown seed so treated germinated promptly and cropped more heavily than did Long Island-grown seed, though failures because of faulty technique or other cause were not unknown. In 1932 and 1933 farmers were instructed in the method, and, as a rule, satisfactory results were secured. The method is, however, rather too laborious and messy for general farm practice, and it was with much satisfaction that the Director was informed by Dr. Denny late in 1933 that he had succeeded in treating whole tubers, the treatments as well as the periods lapsing between treatments and planting being much longer than with cut seed. It appears that this method of treatment can be successfully used in a general way on Canadian-grown Triumphs, and that seed so treated may be planted in Bermuda as early as seed from Long Island.

In the report of the Agricultural Assistant will be found the field report and other information regarding a sample of Louisiana-grown Triumphs received from Prof. J. C. Miller, Horticulturist, Louisiana Experiment Station. This unexpected source of seed appears most promising.

INSPECTION AND REGULATORY SERVICES

Registered Veterinarians. The following are registered to practice veterinary science:

R. L. Tucker, D.V.S.
C. J. Cooper, V.S.
E. S. Browne, B.V. Sc.

Section 11 of the Agriculture Act, 1930, reads, "No person shall practice veterinary science for fee in these Islands without a certificate from the Board entitling him so to do."

Under the provisions of the Boards Act of 1929 and the Agriculture Act of 1930, the Board has made Bye-Laws governing the following.

Control of Animal Diseases. The Government Veterinary Officer is the responsible officer, under the Director, for the proper execution of the Board's Bye-laws, and has the right to enter premises used for the keeping or slaughtering of animals, or the storage or sale of carcases.

Imported animals should be accompanied by certificates of health, which should include the area from whence the animals have been imported; crates should be of adequate dimensions; vessels in which animals may be imported are subject to inspection, as are premises used to house or slaughter animals or store or sell meat; vessels and premises are subject to quarantine; animals are subject to treatment, and meats to be used for food are subject to inspection.

The Board of Health and Board of Agriculture co-operate to control bovine tuberculosis; the first-named employs the Government Veterinary Officer to make the tests, and the latter pays compensation for infected animals destroyed. During 1933 15 infected animals were slaughtered out of a total of 1,218 treated, or 1.14 per cent.

At the request of the Board of Health, a committee of the Board was appointed to confer with a committee of that Board respecting methods of fly control. The Board referred to the Board of Health the suggestion that the feeding of hotel swill to swine should be regulated.

Control of Plant Diseases and Pests. The Plant Pathologist is the responsible officer. Owners and occupiers of premises are required to report the presence of pests and diseases which appear to be of serious nature of recent introduction. Imported plants are subject to inspection, and to treatment or destruction if either is considered necessary. The importation of the following plants is prohibited: banana plants and antirrhinums, and citrus plants, Irish and sweet potatoes and narcissus bulbs from certain areas.

Inspection and Exportation of Nursery Stock. Field inspection of Bermuda Easter lilies and the inspection of all nursery stock and packing material prior to shipment are required.

Under these Bye-Laws the following firms and persons hold licenses to ship bulbs.

T. O. Covel
Henry and Lee
T. A. Hollis, Sr.
E. W. Outerbridge Co.
J. R. Outerbridge
H. E. D. Smith
Stephens Bros.

Inspection and Shipment of Produce. The Inspector of Produce and staff are responsible for the proper carrying out of inspection. All export vegetables (unless packed by Government) are subject to inspection immediately prior to shipment; grades of vegetables are defined, and specifications and make-up of crates. Shippers of produce are licensed and bonded in the sum of £1,000 each (farmers shipping their own produce are exempt from the bond), and the condition of licenses requires that in shipments to Canada each shipper shall confine his shipments to brokerage firms selected by a majority vote at joint meetings of the Board and licensed shippers. No produce except the following may be

exported: root vegetables, leaf and head vegetables, celery, cucumbers, melons, peas, cucurbits, string or French beans and tomatoes. This last condition became law in 1933.

The following firms and persons are licensed to ship produce:

Merchant-Shippers

Benevides and Rego
Bermuda Green Vegetable Growers Association
J. M. Darrell
The Hill Company
O. R. Loblein
Pearman, Watlington and Company.

Farmer-Shippers

F. A. Hollis
Malcoln Hollis
G. Jacome
M. S. Madeiros
E. J. Moniz
Jos. de Moura
Bento Oliviera
E. W. Outerbridge
J. R. Outerbridge
D. C. Robinson
M. F. Simons
R. B. Watson.

Importation of Seed Potatoes. Importers are required to give notice of intention to import, furnish particulars regarding the origin of the seed and make declaration of use; the importation of potatoes from certain countries and areas is prohibited.

Sale of Vegetable Seeds. Vendors of seeds are required to be registered; the varieties of certain kinds of seeds are restricted; all seeds are subject to examination, and samples of the most important kinds should be submitted for testing.

The following firms and persons are registered as vendors of vegetable seeds:

Bermuda Green Vegetable Growers Association
Henry Dunkley and Company
The Hill Company
O. R. Loblein
J. J. Moniz
The E. W. Outerbridge Company
Peniston and Curtis
T. J. Wadson and Son.

Copies of the Bye-Laws above referred to will be furnished free on application.

CANADIAN JOBBERS' CONVENTION

The Director attended the Eighth Annual Convention of the Canadian Fruit and Vegetable Jobbers' Association held at the Royal York Hotel, Toronto, Ont., on 4th to 6th January. Transportation, distribution,

credit and other features of marketing were discussed. Opportunity was given of meeting Canadian fruit and vegetable buyers, both wholesale and retail, and to give information regarding Bermuda vegetables. A report dated 14th January was presented. See "Other Exhibitions."

WEST INDIAN CONFERENCE

Bermuda was invited to send delegates to the West Indian Inter-Colonial Fruit and Vegetable Conference, Jamaica, and Honble. G. S. Patton, M.C.P., and the Director were appointed. Their report, dated 7th November, deals with the recommendations of the Conference which are of interest to this Colony, and they are not a few, and relate to grades and packs of tomatoes, establishment of marketing councils, appointment of a marketing officer, advertising, legislation and shipping facilities.

The principal object of the Conference was to co-ordinate the interests of the Colonies in the West Indian group which sell fruits and vegetables in Canada, and this object will be forwarded to no small extent if the Conference's recommendations are acted on by the Colonies interested.

The Conference was very favourably commented on by the Canadian and West Indian press; for example, the Canadian-West Indies Magazine (Montreal) said, "Judged by the substance of the recommendations and conclusions, it is no idle exaggeration to say that this Conference will go down into history as the most constructive effort of its kind by these Colonies within recent years"; Tropical Agriculture (Trinidad) said, "The recommendations made at this Conference provide ample evidence that much good work has been accomplished. ..... When the measures advocated are put into effect they should go a long way to advance that co-operative spirit so essential to ultimate success"; and the West Indian Critic and Review (Jamaica) said, "The most pleasing feature was to discover that the islands ..... have now learned to think and act collectively".

On 13th December the Board considered the joint report of Mr. Patton and the Director. A majority of their recommendations were concurred in, and none were objected to.

HORTICULTURE

Since 1931 the Board has had under consideration the employment of an experienced landscape gardener to survey the Islands and report on the best means by which the natural beauties and amenities of Bermuda may be preserved. Lack of funds has prevented action.

In 1928 the appointment was made of an Horticulturist trained at the Royal Botanic Gardens, Kew. Since then increasing attention has been given to the propagation of plants for distribution to the Arbour Societies and in other ways. The number of plants issued of late has been greatly in excess of the issues of former years, though the annual appropriation of £150 has been inadequate. This being the case, it is to be regretted that the vote for 1934 has been reduced to fifty pounds.

In addition to directing the propagation and distribution of plants, the Horticulturist has given advice to many estate owners regarding the management of their grounds.

The Annual Agricultural Exhibition has greatly stimulated flower growing.

Of equal importance to the issue of plants and instruction in horticulture is the cleaning up of the unsightly spots which now mar Bermuda's

beauty, and which are frequently evident to those travelling by water, road and rail. Fortunately there are signs — if at present no larger than a man's hand — that the residents of Bermuda are passing to a higher state of civility, for according to Bacon, "When Ages grow to Civility and Elegancy, Men come to build Stately, sooner than to garden finely: As if gardening were the greater Perfection." It may be necessary, however, to hasten the process of evolution by building laws and associated ordinances.

ANNUAL AGRICULTURAL EXHIBITION

The Fourteenth Annual Agricultural Exhibition was held at the Agricultural Station on Tuesday, Wednesday, Thursday and Friday, 2nd, 3rd, 4th and 5th May. Heavy rain on the first day (Tuesday, 2nd) made it necessary to carry forward each day's event. Despite this handicap, the Exhibition was a decided success; like its predecessors.

At the time of writing this report it appears unlikely that funds will be provided for an Exhibition in 1934. This is to be deeply regretted, for "the exhibition" is a source of instruction and pleasure to all, and as a community effort has never been equalled. Its principal benefit is to the youth of the Colony, who, as members of the Boys' and Girls' Agricultural Clubs, are encouraged to excel in the care of animals, the cultivation of vegetables and flowers, and in handicraft of great variety. An annual vote of £300 – £400 should be considered a trifling expenditure when compared with the many excellent results secured.

For several years mention has been made of the need to enlarge the Exhibition buildings and other accommodation. At the close of the 1932 Exhibition the Executive Committee recommended extensive additions to be spread over a period of three years. Their report will be found in the Annual Report for 1932.

Comparisons are made below of the numbers of entries in each class; (a) at Rosebank, average of 1893 — 1903, (b) at Agricultural Station in 1922 when the Exhibition was resumed after the Great War, and (c) in the year under report:

	(a)	(b)	(c)
Horses	22	86	185
Cattle	29	46	118
Pigs	10	2	0
Goats	0	25	30
Rabbits	0	13	174
Poultry	†79	37	234
Dogs	49	43	79
Cats	21	0	0
Vegetables	207	88	577
Fruits	*0	9	98
Flowers and Plants	168	181	1,226
Food Products	85	136	1,332
Arts and crafts	254	304	3,267
Totals	924	970	7,320

The Department is deeply indebted to the many ladies and gentlemen, more than three hundred in all, who by their influence and valuable assistance made the 1933 Exhibition the best of its kind.

† Including rabbits.
* Included in flowers and plants.

Below are given the special prizes liberally donated by persons interested in the Exhibition, and the fortunate winners.

Asser Challenge Cup. Presented in 1927 by His Excellency the Governor, General Sir J. J. Asser. Won by Hamilton Parish for relatively best advance over its previous year's performance, and held by Mr. Jas. H. Hollis, who won the largest number of prizes in the Parish.

S. P. C. A. Cash Prizes. Mr. Harry Sharp, Warwick, won the first prize of two pounds for best cared for hack horse, and Mr. Abel Benevides, Paget, the second prize of one pound.

Mr. Emmanuel de Silva, Devonshire, won the first prize of two pounds for best cared for truck horse, and Mr. Peter de Silva, Devonshire, the second prize of one pound.

Bermuda Railway Company Challenge Cup. Presented in 1930. Won by Mr. Jas. H. Hollis, Radnor Dairy Farm, Hamilton Parish, for best cow in the show.

Barnes Challenge Cup. Presented in 1930 by Mrs. E. C. Barnes for best Jersey in the show. No award made.

Roosevelt-Roosevelt Cash Prize. Five pounds presented by Mrs. J. Roosevelt-Roosevelt for best collection of vegetables shown by a farmer. Won by Mr. J. W. Lightbourn, Smiths.

Carter Silver Challenge Cup. Presented in 1924 by Messrs. James Carter and Co., London, for best collection of vegetables and flowers grown from firm's seeds. No award made.

Roosevelt-Roosevelt Cash Prize. Two pounds presented by Mrs. J. Roosevelt-Roosevelt for best collection of gerberas. Won by Mr. Roy Mayor, Paget.

Purvis Cash Prize. One pound presented by Messrs. J. W. Purvis and Co. for best loaf of bread made with Robin Hood Brand flour. Won by Mrs. F. W. Lines, Pembroke.

Financial Statement of Exhibition. Below are given receipts and expenditure for the last two years:

Receipts.

	1932	1933
Balance brought forward	£ 102 10 6	£ – – –
Granted by Appropriation Act	345 0 0	300 0 0
Donated for special prizes	17 0 0	14 10 0
Gross receipts for advertisements in catalogue and programmes	136 5 0	130 10 0
Ground rents	108 18 0	95 3 0
Post entry fees	6 16 0	1 16 0
Gate receipts	481 4 0	377 18 3
Enclosure receipts	130 5 7	108 10 6
Bicycle receipts	18 16 2	20 1 3
Receipts for meals	6 15 0	– – –
Miscellaneous receipts	15 0	3 0 0
Unpaid adult prize money	7 15 6	11 2 6
	£1,362 0 9	£1,062 11 6

Expenditure.

Prizes to adults	£	419	15	3	£	306	2	6
Prizes to Agricultural Clubs		195	7	9		167	8	6
Prizes for sports		20	5	0		27	8	6
Paid for lost exhibits		1	3	0		3	3	6
Advertising		37	7	5		30	18	10
Printing and commission on advertisements in catalogue and programmes		114	9	8		96	10	5
Stationery and printing		114	2	2		46	18	0
Lumber		56	11	8		12	15	4
Other material		75	11	9		31	15	6
Carriages and meals		36	7	0		21	6	6
Cartage		22	3	0		19	3	0
Labour, field		124	15	3		55	11	4
Watchmen		6	0	0		8	0	0
Gatekeepers		26	0	0		25	10	0
Checking bicycles		10	0	0		10	0	0
Checking cloaks		1	2	6		1	5	0
Clerical assistance		50	6	0		61	18	3
Depreciation, rental, etc. of W. D. stores		26	13	7		15	10	6
Lighting and telephones		6	13	10		5	5	2
Balance carried forward		–	–	–		116	0	8
Unexpended balance reimbursed to Treasury		17	5	11		–	–	–
	£	1,362	0	9	£	1,062	11	6

OTHER EXHIBITIONS

Toronto. A small exhibit of Bermuda vegetables and other products was shown in Toronto in January at the time of the Convention of the Canadian Fruit and Vegetable Jobbers' Association. The vegetables attracted considerable attention. They were afterwards sold for more than sufficient to pay freight and other incidental charges.

Montreal. On 8th to 18th February a joint agricultural and tourist exhibit was shown at the Produced-in-Canada National Exhibition in Montreal. Mr. H. C. Collier, Secretary of the Canada-West Indies League, and Mr. F. E. Holloway, General Manager of Mutual Brokers, Ltd., very kindly staged and cared for this exhibit on behalf of the Trade Development Board and the Board of Agriculture.

London. Bermuda bulbs were included in a display of bulbs at a meeting of the Royal Horticultural Society, London, England; thanks to Messrs. Robert Tucker and Co. Flowers grown from Bermuda bulbs were on view at Hyde Park and Royal Botanic Gardens, Kew.

BOYS' AND GIRLS' AGRICULTURAL CLUBS

Boys' and Girls' Agricultural Clubs were organised in the early days of the Great War as one of many methods to encourage the production of food in the Colony. When in 1921 the Annual Agricultural Exhibition was revived, Club members exhibited, and since that time the activities of the Clubs, of which one is organised in connection with practically every school in the Colony, have centred around the Exhibition. As years have

passed, the children's interest in the Exhibition has enlarged, and, on the whole, their exhibits have progressively improved as well as increased in numbers. If a comparison could be made of the exhibits of 1921 and 1933 a surprising contrast would be seen. The excellence of the arts and crafts exhibits in 1933 were undoubtedly due to the educational exhibit of kindergarten methods and materials arranged by Mrs. Heber Browne, Miss Winifred Rogers and their helpers.

The numbers of Club entries in the years 1922 and 1933 are given below, and are irrefutable evidence of the increasing interest taken in the Exhibition by the children of the Colony.

	1922	1933
Horses	4	26
Cattle	4	18
Goats	10	12
Rabbits	10	114
Poultry	14	110
Dogs	6	32
Vegetables	33	219
Fruits	0	56
Flowers and Plants	9	537
Food products	37	773
Arts and crafts	173	2,577
Totals	300	4,474

The donors and winners of special prizes are given below:

Trott Challenge Cup. Presented in 1926 by Honbl. W. J. H. Trott, M.C.P. Won by Bermuda School for American Children for relatively best advance over its preceding year's performance.

Jackson Challenge Cup. Presented during the Great War by Honble. W. E. Jackson, C.M.G., then Colonial Secretary, for corn competitions, since transferred to vegetable competitions among girls. Won by Angeline Pedro of Whitney Institute Club.

B.G.V.G.A. Challenge Cup. Presented during the Great War by the Bermuda Green Vegetable Growers' Association for corn competitions, since transferred to vegetable competitions among boys. Won by Alfred Pedro of Whitney Institute Club.

Hand Challenge Cup. Presented during the Great War by the late J. P. Hand, C.M.G., M.B.E., M.C.P., for corn competitions, since transferred to vegetable competitions. Won by Whitney Institute Club.

Montgomery-Sears Challenge Cup. Presented in 1930 by Mrs. J. Montgomery-Sears. Won by Elliott School Club for cut flowers. Holder of Cup, Herbert Robinson.

S.P.C.A. Cash Prizes of Two Pounds. August Pedro of Gilbert Institute Club (formerly Dudley Hill) won the first prize for the best designed and executed humane poster, and Olive Benevides of the same Club won the second prize. Nora Hollis of Mount St. Agnes Club won the first prize for the most original humane poster, George Marshall of Gilbert Iustitute Club won the second prize, and Joan Harvey of Mount St. Agnes Club won an extra prize.

AGRICULTURAL STATION

Information regarding vegetable experiments and live stock will be found in the report of the Agricultural Assistant, and regarding horticulture in that of the Horticulturist.

Visitors. Visitors to the Station included His Excellency the Governor, Sir Thomas Astley Cubitt, K.C.B., C.M.G., D.S.O., and Lady Cubitt; Dr. F. A. Bather, Dr. A. B. Randall and Mr. T. Sheppard of the British Museum; Lord Belhaven and Stenton and party; Prof. Herbert Osborn, State University, Columbus, Ohio; Dr. Edwin Jordan, Chicago University; Prof. H. F. Jensen, Prof. E. M. K. Geding and Prof. E. A. Eves, Jr., John Hopkins University; Mr. H. C. Collier, Secretary of Canada-West Indies League; Mr. C. R. Johnson, Vice-President, Canada Cold Storage Co., Ltd., Montreal; and many others.

Office Work. The routine work of the office was satisfactorily performed. Clerical work in connection with the packing of vegetables threw a heavy burden on the Clerk, and necessitated considerable night and Sunday work. Failure to secure former Exhibition entry clerks further increased office work. The Agricultural Bulletin, which completed its twelfth year in 1933, was issued monthly. During the year 1,386 letters were received, and 2,082 dispatched.

Publications Received and Issued. The receipt of a large number of useful publications is gratefully acknowledged.

Publications of the Department were confined to 600 monthly issues of the Agricultural Bulletin, 600 copies of the Exhibition Catalogue, and 500 copies of the Annual Report. On inside front cover will be found a list of publications obtainable free on application.

Repairs and Additions to Buildings and Implements. A new tomato packing house, already mentioned, was built by contract, and a packing shed at Evan's Bay, Southampton. With Station labour the following repairs and additions were effected: an addition to the main Station Packing House and a slat-house measuring 50 feet by 60 feet were built, an office for the Station Foreman was partitioned off No. 2 Store Room, interior woodwork of Station offices was painted and floors varnished, Exhibition fittings were overhauled and repaired, and many minor repairs were effected to buildings and implements.

By the full-time employment of a mechanic, who also operates the power sprayers, buildings and tools are kept in good repair, and considerable building is economically done.

Prison Labour. Prison labour amounted to 529 man-days, and was employed chiefly at road-making, lime-washing, cleaning and Exhibition work. The cost to the Department was £13. 4. 6., exclusive of wear and tear on tools.

Rototiller. This implement was purchased in 1932, and is a very useful cultivating tool. It was operated under a variety of conditions and gave uniform satisfaction. Stable manure and soy beans were put under with it. A charge of thirty-five shillings per day was made for its rental, and it was used in the following parishes: Hamilton, 3½ days; Smiths, 17 days; Devonshire, 23¼ days; Pembroke, 2½ days; Paget, 3 days; Warwick, 2¾ days, and Southampton 7¼ days; a total of 59¼ days.

Pageant. The Community pageant, "The Sleeping Beauty", directed by Mr. John F. Gould, was staged on the Station grounds on 18th — 21st April.

Disposal of Produce. See Appendix C.

Rainfall. See Appendix D.

STAFF

Mr. E. A. McCallan, Director of Agriculture, was absent from the Colony from 28th December, 1932, to 15th January to attend the Convention of the Canadian Fruit and Vegetable Jobbers' Association held in Toronto. From 17th to 26th June he was absent to inspect seed potatoes on Long Island, N.Y. From 11th October to 6th November he was absent to attend the West Indian Fruit and Vegetable Conference, Jamaica.

Reports covering the foregoing were presented, and are referred to in this report. The Director was re-appointed a member of the Immigration Board, and continued a trustee of the Bermuda Biological Station for Research, Inc.

Mr. T. A. Russell, Plant Pathologist, was absent on vacation leave in the United Kingdom from 27th June to 11th September. Though on leave, Mr. Russell gave attention to matters pertaining to his office, and presented a report on his return. Mr. Russell acted as Director from 17th to 26th June.

Mr. W. R. Evans, Agricultural Assistant, was absent as marketing officer in Canada from 18th February to 30th March, and from 10th April to 26th June. He reported fully on marketing, and information on the subject will be found in his annual report. Mr. Evans acted as Director during Mr. McCallan's absences, except in June. Mr. Evans was on vacation leave in Bermuda from 4th September to 4th October.

Mr. E. L. Adams was retired from the post of Inspector of Produce on 28th January, having reached the maximum age. Mr. Adams was for many years an efficient and painstaking Inspector, and his retirement is a loss to the Department.

Mr. J. C. Nauen, Horticulturist, continued to act as Honorary Secretary of the Bermuda Garden Club.

Mr. T. Arthur Hollis, Assistant Inspector of Produce, succeeded to the post of Inspector of Produce.

Mr. C. V. S. Early, Station Foreman, succeeded to the post of Assistant Inspector of Produce. On 22nd May Mr. Early completed twenty-three years' service with the Department. He is not entitled to pension on retirement.

FINANCIAL

Th expenditure of £11,090. 0. 0. was authorised by the Appropriation Act of 1932 and Resolves 5 and 12 of 1933. The sum of £10,985. 7. 0. was expended, a balance of £104. 13. 0. remained in the Treasury, and the sum of £2,434. 9. 7. was reimbursed to the Treasury; the nett expenditure of the Department was, therefore, £8,550. 17. 5. These amounts are exclusive of salaries. Details of expenditure and reimbursements will be found in Appendix E.

During the last ten years the expenditure of the Department and receipts for sale of vegetables, etc., and in late years receipts from Government Packing Houses, were as follows:

Year	Gross Expenditure	Receipts	Nett Expenditure
1924	£ 4,515 10 8	£ 182 19 3	£4,332 11 4
1925	4,851 16 7	129 18 9	4,721 17 10
1926	5,169 6 5	207 8 9	4,961 17 8
1927	4,560 15 5	346 2 4	4,214 13 1
1928	4,175 5 11	157 10 8	4,017 15 3
1929	4,348 6 10	193 0 1	4,155 6 9
1930	6,952 14 2	247 18 9	6,704 15 5
1931	7,418 3 3	280 1 1	7,138 2 2
1932	7,276 7 4	466 7 1	6,810 0 3
1933	10,985 7 0	2,434 9 7	8,550 17 5

Respectfully submitted,

E. A. McCALLAN,
Director of Agriculture.

Agricultural Station,
Bermuda.
6th January, 1934.

Report of The Plant Pathologist, 1933.

Director of Agriculture,

I have the honour to submit my report on the work done and on the occurrence of diseases and pests during the year 1933.

GENERAL REVIEW.

While losses in the crops have been heavy as usual during the year, it is encouraging to be able to report no new diseases or pests of importance, all the major troubles being the familiar ones of past years.

As in the previous year, the most destructive fungous disease was celery blight due to *Septoria apii,* which wiped out the crop in all parts with the exception of a small area in Southampton. The early celery, started in Canada and transplanted in Bermuda in the autumn of 1932, was severely attacked in January, and was for the most part destroyed in spite of frequent spraying; and it provided a virulent source of infection for the main crop when it was planted out, as a result of which this also succumbed. Phytophthora blight, followed by rot of the tubers, was severe on Triumph potatoes in January, on the Garnets and Cobblers in March, and again on Triumphs in the latter half of December, when it spread with extreme rapidity. *Sclerotinia Sclerotiorum* appeared to give less trouble than last year amongst the carrots in transit to the Canadian market, but caused many heavy losses in one shipment of early celery. The only bacterial disease of any importance was black-rot of crucifers caused by *Bacterium campestre,* which was seen particularly on broccoli, cauliflower, and Swedes; while virus diseases were represented by yellow flat or rosette in the lily crop.

Insect pests took their toll of most of the crops, though the loss caused by them was less obvious than that caused by fungous diseases. The failure of the onion crop must be attributed in part to attack by *Thrips tabaci,* the damage being aggravated by weather conditions unfavourable to the crop. Cabbages in the spring were badly attacked by larvae of the looper, *Phytometra brassicae,* and of the butterfly, *Pieris rapae.* The tuber-worm, *Phthorimaea operculella,* was found in potatoes during the summer, causing loss amongst tubers which were stored for any length of time, and it was injurious also to tomato fruits. The scale, *Comstockiella sabalis,* spread very greatly during the summer on the native palmetto, and its control constitutes the most urgent problem to be solved at the present time.

When reviewing the condition of crops at the end of January, it was remarked that damage due to diseases and pests was far exceeded by the havoc caused by the storm which lasted for five days during that month. While this was indeed an extreme case, there is no doubt that wind damage causes a heavy loss each year, which is perhaps not fully realised because it is taken as inevitable. It seems questionable, however, whether all is being done to keep this loss as low as possible, or whether increased use might not be made of windbreaks either of a temporary or of a permanent nature.

In the same way, if the loss caused by diseases and pests were fully realised, there is no doubt that increased care would be given to spray or dust or to apply such cultural measures as would lead to their more

adequate control. It is inevitable that in years of low prices the growers should be unwilling to spend time and money on spraying and other measures of control: but, on the other hand, it must be realised that it is in these very years that a loss of 10 per cent of the crop through fireworm attack or of 20 per cent through blight (losses which are by no means uncommon) will convert a crop which is just profitable into one which is grown at a loss.

OFFICE WORK.

The maintaining of correspondence on pathological affairs, the writing of articles for the Bulletin, and of reports, and the carrying out of the routine duties occupied much time. Publications received have been reviewed as time permitted, and the titles of relevant papers have been indexed, while the re-arrangement of the collection of reprints has been continued.

MAJOR PROBLEMS INVESTIGATED.

Sclerotinia Diseases of Vegetables. The investigation started in 1932 on diseases due to *Sclerotinia Sclerotiorum* was continued in the year under review. Tomato plants growing on stakes in the Station grounds were found to be attacked during January, infection in all cases noted occurring through a leaf at least 3 feet above soil-level, whence the fungus had passed into the stem. Similar attack by the same fungus was seen on cucumbers growing under glass in Paget, this apparently being the first record of its occurrence on this host in Bermuda. Antirrhinum plants in a nursery garden in Paget and at the Station were severely attacked by this fungus, and, on this host also, attack was aerial and not through the soil. A close search made at the time for apothecia of the fungus failed to reveal any, but on 19th February, sclerotia, which were obtained from a rotted cabbage and kept for seven weeks in the laboratory under very damp conditions, were found to have developed fruit-bodies, and on 1st March they were found under natural conditions in the cabbage field.

Attempts were made to transmit the disease to plants of tomato, cabbage, and snapdragon in the greenhouse by placing apothecia about one-half inch below a leaf so that ascospores might be shot on to its surface; but little success was obtained, possibly because this was done in early summer when temperatures were running rather high.

While *Sclerotinia* is by far the most important cause of rotting in carrots during the winter months, it was found to cause no loss to those dug in June, which when stored for two weeks under damp conditions developed slight rotting by species of *Rhizoctonia* and *Rhizopus*. Carrot tops in the winter were found commonly to be attacked by *Sclerotinia*, infection apparently starting in older leaves which touched the soil and passing into other leaves in contact. This possibly explains why bunched carrots with tops are more subject to Sclerotinia rot during transit than loose carrots without tops.

In the hope of finding cultural differences between isolations of *Sclerotinia Sclerotiorum* made from various sources, the fungus was isolated from carrot, cabbage, celery and tomato, and cultured on carrot agar; but no significant difference between the isolates was seen in appearance, rate of growth, or production of sclerotia.

Palmetto Scale. The spread of the palmetto scale, *Comstockiella sabalis*, has been greater during 1933 than in any year since its discovery at St. Georges in 1921. Not only has there been an enlarging of previous areas of attack, but new centres have appeared at some distance from

these areas. The localities in which it is now known to occur are the following: St. Georges and St. Davids, Walsingham, Devils Hole, Flatts, North Shore of Devonshire and Pembroke, Hamilton, Paget Marsh, South Shore of Paget near Elbow Beach, and Warwick East (a small outbreak which it is hoped to eradicate).

The life-history of this scale has never received careful study in Bermuda, and such accounts of it as are available from elsewhere are but meagre. A thorough investigation of this insect and its parasites is necessary before further progress can be made in its permanent control. The following parasites and predators have been collected on palmettos affected with scale, the names of such as are identified having been kindly supplied by the Imperial Institute of Entomology.

Parasitic Hymenoptera.

Aphytis (Aphelinus) fuscipennis How.

A. mytilaspidis. LeB.

Encarsia portoricensis How.

An undetermined species (H 6)
" " " (H 8)

Predators.

Thrips: *Aleurodothrips fasciapennis* Franklin

Mites: Undetermined species.

It is of interest to find that these parasites and predators are not distributed throughout all areas infested by the scale, but that certain species are peculiar to one area and certain to another. For instance, the species H. 8, which has yet to be identified, is abundant on affected palmettos in St. Georges Parish, but has not been taken elsewhere, and *Encarsia portoricensis* seems to share the same limits. *Aleurodothrips,* on the other hand, has been seen in only two areas at Paget Marsh and Pembroke, while *Aphelinus fuscipennis* has been found in all areas, sometimes in great abundance.

Towards the close of the year, a fungus was found growing on dead scale insects in two areas. This has not yet been identified, and it is not known whether this is a parasitic fungus which actually destroys the scales or whether it is merely a saprophyte living on the remains of scales killed by other causes.

Spraying has been done extensively throughout the year, using an oil emulsion containing a medium-heavy lubricating oil and Kayso, and this has given temporary control. Observations suggest that, though the adult scales are killed by the spray, the eggs may survive and the larvae hatch out normally a few weeks later; and accordingly a second spraying is recommended six weeks after the first application. Sulphemulsol, a proprietary insecticide prepared by Trinidad Leaseholds, Ltd., was tried late in the year, and it appears to merit a further trial.

The Potato Tuber Moth. The tuber-worm, *Phthorimaea operculella* Zell., was found in potatoes earlier in the season than the previous year, being seen during the latter half of April, and three lots of potatoes intended for export which showed signs of attack were condemned as unfit for shipment. As a rule, tubers which were infested showed a greenish colour, indicating that they had been incompletely covered by soil, but in one lot grown in Southampton, from which good-sized larvae were obtained, the potatoes had been dug only the day previously and showed no

green colour, suggesting that the moths must have reached them in the ground, possibly through cracks in the soil.

Much loss was caused to tomatoes by Phthorimaea larvae which bored into the fruit usually at the stem end under the calyx. Similar larvae were found mining the leaves of egg-plant and of *Nicotiana Sanderae* in the Station grounds. Adults reared from these three hosts proved to be indistinguishable from the tuber-moth, and, on being sent for identification to the Imperial Institute of Entomology, were stated all to be *P. operculella*. The same species was later found in the leaves and berries of the weed, *Solanum nigrum*.

It is apparent that the common practice of interplanting potatoes with young tomato plants may lead to severe attack of the fruit, since the moths may migrate to the tomatoes from the potato plants when they are dug or from the potato culls which are left on the field and which frequently harbour the pest.

The Ichneumon, *Angitia blackburni*, Cam. was commonly found parasitising the larvae. In one instance where sixteen larvae were obtained from tomato fruits, ten developed normally and six yielded the parasite: while of nine larvae from potatoes seven gave the moth and two the parasite.

Diseases and Pests of Tomato Fruits. As in 1932, a survey was made of the causes of damage in tomatoes rejected at the time of packing, and this was supplemented by observations on the losses occurring in the field. It was found that early in June the chief causes of rejection were non-pathological, in particular immaturity and smallness of fruit, but within a few days these causes became unimportant while the damage due to insect pests increased. By far the most important of these proved to be the larvae of *Phthorimaea operculella* Zell., which is now to be reckoned the chief pest of tomatoes in Bermuda, and to which reference has already been made. Noctuid larvae also proved troublesome, and of several species found inside the fruits, two were reared to maturity and were identified as *Heliothis obsoleta* and *Prodenia ornithogalli*.

Fungous diseases caused little loss in the packing-season, but in the winter months *Phoma destructiva* was very injurious to the ripening fruit. Blossom-end rot was seen after a dry spell at the middle of June, but accounted for severe loss in only one lot of tomatoes grown in Southampton.

The Beet Fireworm. In view of the complete destruction of autumn-sown beets last year by the fireworm, *Hymenia fascialis*, it was planned to study the life-history and means of control of the pest this autumn, but owing to the absence of severe attack in the field, the latter part of the programme could not be carried out in full. Moths occurred abundantly on the common weeds, *Amaranthus hybridus* and *Portulaca oleracea*, during the autumn months. A female when captured and caged overnight with beet seedlings in the laboratory or greenhouse was found to lay her eggs freely, about a score being frequently laid by the next morning. These were found chiefly on the under side of the leaves, but less commonly on the upper surface or on the stem. They occurred singly or in small clumps and were scale-like, slightly oval, about ½ mm. long, and of an iridescent green colour. At a temperature approximating to 75° F., the minute pale-green larvae hatched out three days after the eggs were laid, and at once began feeding on the lower surface of the leaf. They fed voraciously, and in thirteen days were about ¾ of an inch in length, of a deep-green colour with whitish lines along the back. Pupation then took place in the surface soil, the reddish-brown pupa being enclosed in a case of

soil particles bound together with silk. The moths emerged after a further period of 13 – 15 days.

The life-cycle may therefore be completed in a month at the temperatures prevailing in October; and as one moth in captivity was found to lay more than 200 eggs during ten days, the rapid spread of this pest can readily be understood. The habit possessed by the larva of binding leaves together and sheltering between them, as well as its habit of feeding on the under side of the leaves, render more difficult any control by spraying.

In the mild attack that occurred in the field this autumn, the three treatments applied, namely derris spray (Katakilla), arsenate of lead spray, and arsenate of lead dust, were all adequate, the dust being if anything slightly superior to the sprays.

Minor Investigations. Tests are being made with proprietary insecticides containing derris and barium fluosilicate with the view of finding suitable substitutes for the arsenates which have up till recently been recommended for vegetable crops.

WORK DONE ON VACATION LEAVE.

Visit to Montreal. During a brief visit to Montreal, the opportunity was taken to call on the two firms of brokers who handle Bermuda produce and to discuss with them the condition of the vegetables on arrival.

Lily Conference. The Lily Conference of the Royal Horticultural Society, held in London from 11th – 13th July, was attended, at the kind invitation of the President and the Lily Committee. An excellent display of lilies of many species was on view in the Society's hall, and papers were read on various aspects of lily culture by some of the foremost growers.

Of particular interest were the papers on the soil conditions suitable for the cultivation of various species of lilies. It was suggested by two or three speakers that the importance of lime has been over-estimated in the past, and that many lilies believed to be intolerant of it may grow in its presence so long as leaf mould is present also, and drainage good. If this is the case, there seems reason to anticipate the existence of species other than the Easter lily which will tolerate Bermudian conditions, and some time was spent both at the Conference and subsequently in obtaining expert opinion as to which species were likely to succeed.

The subject of lily diseases was discussed at the last meeting of the Conference, when Mr. Ogilvie described his work in Bermuda on yellow flat, and a short account of the inspections now enforced was given.

Interesting though the papers were, of still greater interest were the contacts made and conversations held with authorities on lily culture.

Further Work on Lilies. At the suggestion of Mr. R. L. Tucker, visits were paid to a few bulb-dealers and growers of Harrisii and other longiflorum lilies, and some insight was gained into their requirements and points of view.

Conference of Advisory Mycologists and Entomologists. A conference held by the advisory Mycologists and Entomologists of England and Wales at Bristol on the 25th and 26th July was attended by invitation. At the meetings there were interesting papers and discussions, amplified by practical demonstrations, on methods of spraying and diseases of vegetables.

Other Work Done. A number of institutions at which plant pathological research is being done, including the Imperial Mycological and Entomological Institutes, were visited, and opportunities were taken to consult some scientific literature not available in Bermuda.

ADVISORY WORK.

Field observations were made on the occurrence of diseases and pests in the crops throughout the year, and advice was given to growers as to control measures.

Assistance was given to gardeners on many occasions in the growing of healthy ornamental plants and fruit-trees.

The crops on the Station grounds were supervised with respect to diseases and pests, and treatment was recommended when necessary.

INSPECTION SERVICES.

Lily Inspection. The lily fields were inspected between the 10th and 21st January, and again between the 8th and 15th March; and in cases where it was thought desirable, a third inspection was made during April or May.

Out of a total of 129 fields inspected, 117 fields (representing 93.6 per cent of the total area) passed the final inspection, giving an area of 4,851 sq. rods or 30.4 acres of lilies certified as fit for shipping, which is 70 per cent of the area for 1932. All fields which were condemned failed on account of yellow flat disease, no certificate being given for fields in which this was seen to occur at the time of the final inspection.

Inspection of Plant Importations. There was a small increase in the number of plant importations made as compared with the previous year. Parcels of plants and bulbs inspected by me at the Post Office numbered 190, while consignments seen at the docks numbered 79. Some of the consignments were very large, seventy boxes containing in all about 140,000 strawberry plants being imported on one occasion. It is manifestly impossible to inspect such a consignment with any degree of thoroughness, and when it is also borne in mind that quantities of cabbage, celery, lettuce, tomatoes and other vegetables are imported subject to no inspection whatever, the inadequacy of our plant quarantine system may be realised. It is surprising that we have so far escaped a number of serious pests which are widespread on the North American Continent.

Insects intercepted on plant importations included scales and mealy-bugs, aphids and white-fly from the United States, scales from Canada, and aphids, scales and mealy-bugs from the West Indies.

Seventeen fumigations of plants were made, and four consignments were sprayed in order to destroy these insects. A parcel of roses from the United States attacked by the rust *Phragmidium mucronatum*, three parcels of narcissus and two of Lilium bulbs, imported contrary to regulation, were destroyed.

Inspection of Seed for Disease. A test of the celery seed imported from Messrs. Clause, France, showed it to be highly satisfactory, no trace of blight infection being found. Seed obtained through Messrs. F. C. Stokes & Co., U. S. A., was also free from blight.

Spraying Service. The two motor-sprayers were kept in working order throughout the year, Sprayer No. 1 being stationed in Southampton and No. 2 in Paget. The latter machine has been giving insufficient pressure for the spraying of palmettos, but this defect has now been remedied by replacing certain parts, and with the new length of hose-pipe which has been acquired it should give more effective results. One or other machine was in action during 77 days, which is almost twice the corresponding figure for the previous year. The increase is partly accounted for by the greater amount of spraying done against palmetto scale, which took place

on 21 days, but it is also due to increased use of these machines by some of the farmers for their crops, chiefly potatoes and tomatoes.

The hand dusting-machines were used frequently on the crops in the Station grounds, and were hired out on occasion.

Supplies of oil emulsion were kept in stock, and were distributed when necessary for the control of scale insects.

THE CHIEF DISEASES AND PESTS OBSERVED DURING THE YEAR.

Export Vegetables.

Beans. Mildew, *Erysiphe polygoni,* was destructive of string beans, especially during the autumn and winter months. The use of sulphur dust is recommended for the control of this disease.

Beets. Damage due to the fireworm, *Hymenia fascialis,* was unusually light during the autumn months.

Cabbage and Kale. In the early months of the year severe loss was caused by larvae of the looper, *Phytometra brassicae,* and of the butterfly, *Pieris rapae,* but during a spell of wet weather, looper caterpillars were well controlled by attack of a fungus.

Head-rot of cabbage caused by *Sclerotinia Sclerotiorum* was found to be destructive in a few fields, in one of which it accounted for no less than 30 per cent of the crop. While, apart from the rotation of crops, no effective means of control is known, the removal of rotted cabbages from the field is strongly recommended, since there were obtained from one rotted head no less than five hundred of the black sclerotia, which lead to the dispersal of the fungus.

Black-rot, *Bacterium campestre,* occurred commonly on kale and other crucifers early in the year. The disease is carried over on the seed as well as persisting on refuse in the soil, so that treatment of seed with corrosive sublimate might be tried in addition to the rotation of crops.

Carrots. The storage rot due to *Sclerotinia Sclerotiorum* was the only disease of importance.

Celery. *Septoria apii* destroyed the greater part of the crop.

Cucurbits. The powdery mildew, *Erysiphe cichoracearum,* was destructive to the foliage, and greater use should be made of sulphur dust in its control.

Heavy damage to squash was caused by the melon borer, *Margaronia hyalinata,* and a borer obtained from cucumbers was identified as the allied species, *M. nitidalis.*

Onions. A long dry spell, combined with severe attack by *Thrips tabaci,* and followed by a period of heavy rain, led to rotting in the onion crop. During the spring months, onion tops were devoured by larvae of the Noctuid, *Prodenia ornithogalli,* which were found sheltering within the leaves.

Potatoes. *Phytophthora* blight was destructive in the early months of the year, and occurred again in epidemic form in December, being followed in each case by black-eye rot of the tubers. Scab caused by *Actinomyces scabies* caused heavy loss in some fields, and is difficult to control where potatoes are grown often on the same land. Wherever possible, land which is badly infected should be given a rest from potatoes, and a green manure crop should be grown in the summer months.

Virus disease caused loss in the Garnet crop in spring, and while most of the Triumph seed planted in the autumn was of excellent quality, part of it showed a high proportion of leaf-roll. Some loss occurred also in the Long Island Triumph seed from Fusarium rotting, which spread through the barrels during storage before planting.

Tomatoes. Diseases and pests of the fruit have already been described. Septoria blight caused by *S. lycopersici* was the most destructive disease on the vines, while leaf mould, *Cladosporium fulvum*, occurred to a less extent. These were checked by the constant use of copper-lime dust or of Bordeaux spray.

An isolated case of Fusarium wilt was noticed, and may possibly have resulted from the use of infected seed.

OTHER PLANTS.

Lilies. Stump-rot cause by Phytophthora occurred severely during November and December, especially in the neighbourhood of Crawl. In land where it tends to occur, the lilies should be sprayed with Bordeaux mixture as soon as they appear above the ground and again a fortnight later.

During May one severe case of Botrytis blight was seen, in a small field of lilies which had been neglected, but otherwise this disease caused little harm.

The presence of the virus disease, yellow-flat or rosette, necessitated the removal of many plants from the fields, being aided in its spread by an abundance of the vector *Aphis gossypii* during part of the growing season. There seems no doubt that the loss caused by this disease in the field could be greatly reduced if growers would make an earlier start in digging up affected plants, and if more attempts were made to control the insect vector.

Damage to bulbs in the ground caused by white grubs, the larvae of the beetle *Ligyrus tumulosus*, was reported by some lily growers.

Gladiolus. The thrips *Taeniothrips simplex* Morison, caused destruction of the flowers of gladioli during spring and early summer in Devonshire. Growers were advised to burn the plants where attack was most severe, and to use naphthalene flakes on such bulbs as were stored over the summer.

Antirrhinum. Snapdragon rust, *Puccinia antirrhini*, was much less destructive this spring than last. It was found by the Horticulturist on 1st December on plants which had lasted over the summer, indicating how this harmful disease is carried over from one season to the next.

Strawberry. The negro-bug, *Pangaeus bilineatus*, was found damaging strawberries, the puncturing of the fruit being followed by a rot.

Grape Vine. Anthracnose or birds-eye spot due to *Gloeosporium ampelophagum* was troublesome on grapes, but spraying with Burgundy mixture appeared to give some measure of control.

Mediterranean Fruit Fly. During May, larvae of the fruit-fly were found in the pods of Fava beans, and also in bananas which had been permitted to ripen on the tree. This pest caused no trouble in the Station grounds during the year, and was not reported from any source between September and the end of the year. In the absence of adequate records, it is impossible to say whether its scarcity at this season is an annual feature or whether it is an unusual occurrence brought on by adverse conditions.

Cottony Cushion Scale. A severe attack of *Icerya purchasi* occurring on Pittosporum in a garden in Somerset was very effectively controlled by the Coccinellid *Rodolia cardinalis*.

RECORD OF MOVEMENTS.

I acted as Director from 17th to 26th June, and went on vacation leave to England on 27th June, returning to Bermuda on 11th September.

ACKNOWLEDGMENTS.

Amongst the many to whom I am indebted for assistance, special mention is due to the Imperial Institute of Entomology for kindly identifying a number of insects; and to Mr. R. L. Tucker and Mr. Lawrence Ogilvie for assistance in studies made during my visit to England.

I would also gratefully acknowledge the many specimens sent in to my office, two of special interest being a rare Planarian worm received from Mr. Brownlow Gray and passed on to the Biological Station, and an uncommon Gasteromycete from the Principal of the Progressive School, Somerset.

Respectfully submitted,

T. A. RUSSELL,
Plant Pathologigst.

22nd January, 1934.

Report of The Agricultural Assistant, 1933.

The Director of Agriculture,

I have the honour to submit my report for the year 1933.

AGRICULTURAL STATION

Vegetable Seed Tests. During the season 238 samples of seed were tested for viability. The local registered seed vendors submitted 78 samples, and the Department imported 160 samples from various sources. On the whole, the germinative results were satisfactory. Farmers now come much more frequently to the Department for advice on the selection of seed than formerly, and as a result their purchases are of smaller quantities at a time in order to obtain fresher stock later on. A smaller number of varieties planted has given greater uniformity in vegetables exported.

Vegetable Field Tests. These tests covered only export vegetables, due to the claims on the time of the staff made by the grading and packing of farmers' vegetables for export.

Beans, bush. Consistently good results were obtained with Bountiful and Tennessee Green Pod. While the latter is not such an attractive bean as the former, it is a week or ten days earlier, is more resistent to adverse conditions, and a heavier cropper under such conditions. Under good growing conditions, both varieties can be relied upon to give satisfactory crops.

Beets. During the major part of the season fire-worms were very troublesome, and it was difficult to make accurate comparisons of varieties. It was observed that fire-worms did not attack Early Wonder to the extent that they did Crosby's Egyptian and Early Flat Egyptian, but further tests must be conducted before it can be determined whether or not this variety is consistently more resistent to the pest.

Cabbage. Seventeen samples were tested. The superiority of Charleston Wakefield for export is now generally accepted by farmers. The tests conducted at the Station this season confirmed our previous observation that this variety is better suited than any other both for local use and export purposes.

Carrots. Progress was made in producing a general purpose carrot. The seed from stecklings sent to Canada in the previous year was sown in November, 1932, and the roots were lifted in February. A further selection of roots from these was sent to the Central Experiment Farm, Ottawa, in March, and a quantity of seed from these was received and planted in November, 1933.

Tomatoes. The Autumn and Winter test was conducted under more favourable weather conditions than the previous year. Most of this test was in progress during the Fall of 1932, but since the final results were not complete until 30th January, the findings are recorded in this year's report.

The following varieties were tested: Best of All, Bonny Best, Break O'Day, Earliana, Globe, John Baer, Marglobe and Pritchard. The experiment was conducted in the Eastern plot, South field, the area of which is 45 rods. Soy beans were grown in the plot during the Summer, and were ploughed under in August, and a light dressing of barnyard manure was applied to the ground three weeks prior to planting.

The seed was sown on 18th August, 1932, and the seedlings transplanted into the test plot on 23rd September. The vines were planted in double rows, 3 feet between rows, and 18 inches each way between vines in each double row. The vines were trained to ¼-inch, round, iron rods 5 feet long, which were grouped together in units of four in each double row and brought together at the top and tied. Lateral growth was pruned at frequent intervals, and the main stems were tied to the iron rods about every 10 inches. The vines were dusted or sprayed at frequent intervals to control blight and chewing insects. Castor pomace at the rate of 1,000 lbs. per acre was applied to the plants on 14th October.

The total yield was 7,680 lbs., or an average of 170 lbs. per rod. The high winds that prevailed from 25th to 28th January reduced the yield to some extent, and when the vines were pulled up there was considerable nearly matured fruit, which under more favourable conditions would have been reaped.

Cost and Values.—While this experiment was primarily conducted to determine the varieties most suitable for Bermuda conditions, it is interesting to note that, although the labour involved was considerably greater than that required under ordinary farm practice, the experiment proved a paying proposition, as the following account will show:

Costs				Value			
Seed	10	0		5,760 lbs. fruit @ 7d....	£168	0	0
Labour preparing seed-bed and attention during seedling stage	3	0	0	1,920 lbs. fruit culls no value	...	...	...
Labour preparing land for planting	3	10	0				
Barnyard manure, 18 loads @ 8/-	7	4	0				
Fertiliser, 5 bags @ 8/-	2	0	0				
Dusting and spraying, including labour and material	10	0	0				
Labour, pruning and tying	18	0	0				
Labour picking fruit	8	0	0				
Depreciation allowance on iron stakes	3	0	0				
Totals	£55	4	0		£168	0	0

Nett value, £112. 16. 0., or a nett profit of fifty shillings per rod of ground.

VARIETAL REPORT

Variety	Average yield per rod	Average Pack Sizes: Large, 72's and larger	Medium 98's	Small, 144's and smaller	Remarks
Best of All	251 lbs.	5%	60%	35%	A vigorous grower; heavy cropper and highly resistant to disease and damage by wind. Fruit fairly solid, nearly round in shape and uniform. The small size of the fruit makes it undesirable for export, but its heavy cropping and vigour make it desirable for local use. Matures with Bonny Best.
Bonny Best	163 lbs.	20%	60%	20%	A vigorous grower and fairly resistent to unfavourable growing conditions consequently a reliable cropper. Fruit fairly solid and round in shape, but not always uniform. Matures a week later than Earliana.
Break O'Day	170 lbs.	40%	50%	10%	Similar in growing habit to Bonny Best Fruit fairly solid, and desirable globe shape. Matures with Bonny Best.
Earliana	190 lbs.	20%	60%	20%	Of moderate vigour, but susceptible to blight and wind injury. Fruit solid, but not uniform in shape. Not recommended.
Globe	163 lbs.	30%	55%	15%	A vigorous grower. Fruit fairly solid, but its purplish colour is not desirable. Matures 2 weeks later than Bonny Best. Not recommended.
John Baer	100 lbs.	15%	60%	20%	Similar to Bonny Best in most respects, but the fruit averages a little smaller.
Marglobe	149 lbs.	35%	35%	10%	A vigorous grower of dwarf habit. Fruit fairly solid and desirable globe shape. Matures ten days later than Bonny Best. Not recommended on account of being a light cropper.

Variety	Average yield per rod	Average Pack Sizes: Large, 72's and larger	Medium 98's	Small, 144's and smaller	Remarks
Pritchard	190 lbs.	25%	60%	15%	A dwarf grower, which requires very little pruning. The main stem often runs into a blind end, and in such instances care must be taken to let the top lateral shoot take its place. The fruit is solid and a desirable globe shape. It matures about a week behind Bonny Best. Highly recommended for growing on stakes for Fall crop.

CONCLUSIONS. (a) For Fall planting under average weather conditions, the growing of tomatoes trained to stakes offers a reasonable profit above the cost of production, and under favourable growing conditions, a handsome profit may be expected.

(b) The two best varieties to grow under all conditions are Break O'Day and Bonny Best.

(c) Best of All and Pritchard are promising varieties for Fall planting.

The main tomato experiment conducted during the exporting season was abandoned on account of unfavourable weather conditions injuring the vines, and of pressure of work in connection with marketing investigations.

Potato Tests.

Winter Planting. As the sale of Garnets in the New York market has fallen off considerably within the last few years, and since the Canadian markets require a white-skinned potato, attention has been given to growing Irish Cobblers and Green Mountains during the usual Garnet season, and with encouraging results.

The comparative test this season was made in Rosebank field, planted on 13th January. The plantings consisted of two samples of Garnets, one from Nova Scotia and the other from Prince Edward Island, and Irish Cobblers, Green Mountains and Triumphs from Prince Edward Island.

The growing conditions during January and February were favourable, but growth was retarded by heavy winds in April.

The Plant Pathologist inspected the plantings for diseases, and observed the Garnets to be affected with a high percentage of what appeared to be "crinkle." The plants so affected appeared in some instances to be infected with both mosaic and leaf-roll. This is the first occasion that this disease has been noted here.

The Nova Scotia Garnets contained 7.2 per cent leaf-roll as against 4.2 per cent in Prince Edward Island stock.

The field readings were as follows:

Variety and Origin	Vigor	Leaf-roll	Mosaic	Crinkle	Yield per rod
Garnets, Nova Scotia J. A. Sutton	75	6.7%	Seen	23%	70 lbs.
Garnets, Nova Scotia Geo. Yuill	78	7.7%	Nil	Nil	76 lbs.
Garnets, Prince Edward Island J. Lester Douglas	90	4.2%	Seen	Nil	89 lbs.
Irish Cobblers, Prince Edward Island Nickerson & Crease	100	.2%	Nil	Nil	101 lbs.
Green Mountains, Prince Edward Island Nickerson & Crease	98	.7%	1.1%	Nil	98 lbs.
Triumphs Prince Edward Island Nickerson & Crease	90	Nil	2.7%	Nil	86 lbs.

Variety Katahdin.—A sample of a recently introduced variety named "Katahdin" was received from the United States Department of Agriculture on 1st February, and was planted immediately. The results obtained indicated that this potato may prove a profitable variety to grow for the Canadian market. The tubers resemble somewhat Irish Cobblers in shape and texture, but are much smoother. In this test they produced vigorous growth, yielded 94 lbs. per rod, and were free from virus diseases.

Onion Tests, Bulb Selection. The selection work with respect to bulbs sent to California for production of seed has now reached a point where seed can be produced in sufficient volume to take care of our entire requirements. Seed originating in California, whether grown from Bermuda selected bulbs or produced from commercial stocks, is superior to any strain received from Teneriffe.

Live Stock. The following animals were carried over:

Guernsey bull Montrose Hector (143022); born 24th Jan., 1927; bred in Bermuda.

" " Montrose Hermes (194225); born 19th Jan., 1931; bred in Bermuda.

" cow Albamont Juliet (85736); born 20th Apr., 1918; imported from U. S. A.

" " Canadian June (33080); born 8th June, 1926; imported from Canada.

" " Joy of Montrose (302700); born 8th Mar., 1930; bred in Bermuda.

" heifer Jean of Montrose (349649); born 4th Oct., 1931; bred in Bermuda.

" " June of Montrose (377310); born 19th Dec., 1932; bred in Bermuda.

The following animals were added to the herd during the year:

Guernsey bull calf, Montrose Governor; born 10th Dec., 1932; bred in Bermuda.

" cow, Amazon of Ware (304852); born 10th Jan., 1928; imported from U. S. A.

" bull calf, Traveller of Ware (211965); born 15th Oct., 1933; imported from U. S. A.

" heifer calf, Joyful of Montrose (398007); born 13th Dec. 1933; bred in Bermuda.

The following animals were disposed of during the year:

Canadian June, to Mr. A. Terceira, Southampton.

Bill (a grade), to Mr. Malcolm Hollis, St. Davids.

Canadian-Grown Celery Seedlings

The experiment of growing celery seedlings in Canada and bringing them to Bermuda for early planting with the view of extending the shipping season for this commodity was continued. Unfavourable weather conditions during the growing season, the presence of Septoria blight, *S. apii*, in the fields and low market prices in Canada during most of the season made the experiment uneconomical.

Plans were made by the Department in co-operation with Messrs. Dupuy & Ferguson of Montreal to continue the experiment this season, but unfortunately an early frost in Canada killed the seedlings before they were ready to be transferred.

While the scheme thus far has not proved a success the experience gained has brought useful information to guide us in the future, and I believe that eventually the scheme will prove an advantageous one. Further experiments should be carried out during 1934, but caution should be exercised not to go into it too heavily until we have further experience to guide us.

MARKETING.

I acted in the capacity of Marketing Officer in Canada during the major part of the shipping season; my first visit was from 18th February to 30th March, and my second from 10th April to 26th June.

General Observations. On the whole, the results for the season were disappointing to all concerned. The contributing causes were three: Business conditions generally were worse than in the previous season, wholesale prices generally were lower than in the year previous, but the cause of most of the low sales may be largely attributed to the poor condition of Bermuda vegetables.

Maritime Provinces. Considerable quantities in excess of the immediate requirements were shipped to Halifax and Saint John, and much of it had to be stored and sold as the demand occurred. At one period a surplus of approximately 4,000 crates carrots, 2,000 crates celery, 3,000 crates onions and 1,000 crates miscellaneous vegetables were held in storage. While large over-shipments incur additional expense for handling and sometimes considerable loss from shrinkage, there is a distinct advantage in having a reasonable reserve to draw from between steamers, as it is extremely difficult to accurately estimate the requirements of the markets for the fourteen days' interval between the arrival of steamers. On account of the more favourable selling conditions obtaining

in the Maritimes than in Upper Canada, shippers are prone to overship to this market to a greater extent than is justified, with the result that the double handling and re-conditioning expenses greatly reduce the profits of the grower.

Upper Canada. Considerable quantities of vegetables were stored in Montreal at various times during the season. This was not due to over-supplies, but to holding for better prices, and re-conditioning prior to selling vegetables that did not arrive in marketable condition. A striking example of how close co-operation between the representative brokers saved money for the growers is illustrated in connection with the storing of carrots. Bermuda carrots were selling in the Maritimes at the time for $1.75 per crate, while the free selling price in Montreal was about $1.00. Had the Montreal brokers sold the carrots freely at that price, some would have been shipped to the Martimes at an additional expense of about 20 cents for overland freight, and this would have had the effect of establishing a selling price of around $1.25 for carrots shipped there direct from Bermuda. On the contrary, the Mutual Brokers stored the supplies consigned to them and sold them in small lots at a time from storage, thus preventing their sale in the Maritimes.

Comments on Condition of Shipments. *Beans.* The tomato lug proved a suitable container for shipping beans. Although wax varieties are favoured in Upper Canada, the green varieties may be sold readily, provided they are in the proper condition. The tendency in the past has been to ship overgrown stock, and the same was true of this season's shipments, although not to such an extent as formerly. A great deal of loss of weight takes place between the time the beans are packed and the time they arrive in Canada. On checking up, I found the shrinkage varied from one to four pounds per crate.

It is difficult to estimate to what extent a profitable market can be developed in Canada for beans, as up to the present time no serious effort has been made to grow beans for export, but only to dispose of surpluses to Bermuda local requirements. It is pointed out that beans cannot be grown in Canada during the Spring months, and on account of the perishable nature of the crop, surpluses cannot be stored and sold during the off season, as is the case of some other vegetables. Under these circumstances, it may prove that greater attention to beans for export may prove them more profitable than some other vegetables.

Beets. Under ordinary circumstances, there is very little demand in Upper Canada for beets without tops, no matter how good they may be. The consumers who purchase through the retail stores demand new beets with tops; restaurants and such like institutions do not use new beets until old beets are unobtainable, which may be about the end of May or later. Some of the bunched beets shipped this season arrived in good condition, but taking the shipments on the whole it cannot be said that they were satisfactory.

Cabbage. The cabbage market this season was pretty steady, except during a time in May when it sky-rocketed for about two weeks, but prices never equalled those of last season. Much of the cabbage arrived in Canada in poor condition. This was particularly true of a shipment of 858 crates forwarded to Halifax by Lady Hawkins on 22nd April, and 1394 crates forwarded by Lady Rodney on 10th May. The first-mentioned shipment went forward in ordinary storage, because of lack of cold storage space, and much of the spoilage may be attributed to that. The trouble in the shipment to Montreal is not so easily explained. It was carried in cold storage, and the temperature of the contents on unloading was from 48° to 50° F. There was much decay, however, both on the leaves and on the stem

ends. Only a very limited quantity could be sold off the dock, and since deterioration was developing rapidly, the balance was placed in cold storage and from there sold in small lots.

The new crate proved a very suitable container; it is much easier to handle, and is much neater in appearance than the old crate.

Carrots. The sale of carrots was disappointing, due largely to the abundant supplies of stored domestic carrots, which were available up to the end of May.

In my report last year I pointed out that the scarcity of stored domestic carrots last season enabled us to realise very high prices for ours. Unfortunately, this advantage was denied us this season, and this, coupled with the fact that imported bunched carrots could be purchased very cheaply, depreciated the value of ours to such an extent that their free selling value in Upper Canada was below production and marketing costs. We fared better in the Maritimes, as the advantage of direct steamship service to Halifax and Saint John obviated railroad expenses and other incidental charges, thus enabling us to compete more successfully with imported supplies purchased through brokers in Montreal and Boston. As already explained, large quantities of Bermuda carrots, surpluses to the immediate market requirements, were held in cold storage in Halifax, Saint John and Montreal. Some of these were held for several weeks, and there was considerable loss in repacking when they were finally sold, due largely to attacks of the fungus *Sclerotinia sclerotiorum*, which is becoming an increasingly destructive disease. Bunched carrots appeared to be more susceptible to it than topless carrots, for the spread of infection was much accelerated through the tops.

Celery. The condition of the celery was generally very poor throughout the season. Celery prices at United States production points were low until the end of May, when they began to rise, and eventually doubled, but by that time our shipments had almost ceased.

The shipments to Halifax and Saint John were considerably in excess of requirements, with the result that over 2,000 crates were held in storage in the Maritimes from April onwards. Had the celery been in good condition when it was received, the storage holdings could have been kept over several weeks without depreciation. On the contrary, much of the celery shipped was badly affected with blight, a fair amount was too small to be of any use for sale in the rough, and naturally, there accumulated a large supply of unsaleable stock by the middle of June. To move the unsaleable stock, Messrs. J. Hunter White, Ltd., started early in the season to recondition their saleable stock by washing it, stripping off the damaged portions and wrapping the cleaned stalks in parchment paper. Messrs. J. W. Gorham and Co. started the same procedure during the first part of June.

Cucumbers. The first shipment to Montreal ex Lady Rodney on 10th May made a very poor impression. The quality and size were irregular, and the gross sales averaged only $1.60 per crate. The shipments following this were much better graded, but not at any time was the quality equal to importations from other points. The second shipment to Montreal ex Lady Somers on 24th May appeared to have been chilled in transit, and a claim against the steamship company was made accordingly. The shipments following this also aroused suspicion of chilling, which suggests that the temperature of 40° to 45° F., fixed by the Canadian National Steamships for carrying cucumbers, is too low. During the previous two seasons when they were carried at 50° to 55° F., no loss was experienced from chilling.

Onions. The first consignment of onions to arrive in Montreal was 205 crates ex Lady Somers on 27th April. These were not in good condition, but since it is not unusual for the first onions of the season to arrive in poor condition, it was confidently expected that the next shipment would be better. Contrary to expectations, however, the next shipment of 556 crates ex S. S. Chomedy on 5th May was no better. Closely following this there arrived 2,038 crates ex Lady Rodney on 10th May, and another shipment of 6,753 crates ex Lady Somers on 24th May, making a total of 9,552 crates to arrive in Montreal within a month. Had the onions been in good condition, they could have been disposed of rapidly at remunerative prices, but since their condition was unacceptable to the regular trade, there developed a difficult problem. The outlet was narrowed down to small jobbers, who in turn had to depend almost exclusively on the peddler trade, and since the demand was limited, we were soon confronted with the problem of having accumulated supplies which were deteriorating very quickly. Efforts were made to sell small quantities outside of Montreal, but it was soon found that this market was also blocked. The first reaction to this was felt when a firm in Ontario returned 30 crates to Montreal freight collect, they having taken the loss of the inward freight themselves. Facing the contingency of having several thousand crates rotting on the dock, the Mutual Brokers moved the entire lot to storage with the least possible before starting to repack them. At the outset the prospects looked delay in getting them out of the crates meant greater decay, and every effort was made to spread out on the floors of the storage as many as possible before starting to repack them. At the onset the prospects looked quite hopeful, but later it became apparent that the loss through decay would be much more than was at first anticipated. The Canada Cold Storage Co. very generously made a special low rate for storage, and also installed steam heat and air circulating fans in one of the storages in an effort to provide a satisfactory drying process. The steam heat process was quite successful, but since the volume of onions was too large for the limited facilities, the advantage was realised only to a limited extent. While the outcome was by no means satisfactory, it was, in my opinion, the only means that could have been adopted to prevent a more serious loss to the growers.

The situation in the Maritimes was much the same, for brokers were up against the same difficulties, but their volume was not as great, and consequently the outcome was more satisfactory.

Parsley. Most of the shipments of parsley were not successful. Much of it arrived in poor condition, and what did arrive in fair condition did not hold up for long after arrival. The cause of the parsley not holding up appears to be due to the fungus *Sclerotinia sclerotiorum.* It would appear that under the conditions now existing in Bermuda parsley cannot be sold profitably.

Potatoes. The increase in shipments of potatoes over last year was very satisfactory, but unfortunately prices realised were not very remunerative to the growers. However, taking into consideration the low value of potatoes in the markets of the United States and Canada during our shipping season, we were fortunate to secure the prices we did. Unlike our onions, potatoes sold quickly to the regular trade, and the chain stores bought them during the latter part of April and the major part of May. The Garnets were not well liked, and in order to sell these the broker had to pro rata his sales of Garnets and Cobblers. This method worked out quite satisfactorily this season, but had the shipments been in excess of the market requirements, I do not think that the same arrangements could have been worked satisfactorily.

Tomatoes. Unfortunately the tomato crop was late coming into bearing, and Canadian domestic tomatoes came on the market a little earlier than last season, thus confining the marketing period for Bermuda tomatoes from 15th May to 15th July. Earlier shipments would probably have made less money, as the application of the dumping clause under the tariff regulations, providing for 3 cents per lb. added to the invoice value, was put into effect from 25th May to 15th June.

There was a noticeable improvement in the grading and packing of farm pack, and Government pack was more evenly and attractively wrapped. There is too strong a tendency among growers to pick immature fruit. This was not of serious consequence this season because during June and July immature fruit will ripen fairly well, whereas earlier in the season they shrivel up with little change of colour.

The sale of Gems this season proved satisfactory, but it should not be assumed, however, that in another season they will not injure the sale of the larger sizes. I am of opinion that, except during a late season as this year, the sale of Gems should be discouraged.

Failure of Early Celery to Arrive in Good Condition. The shipments of celery from Candaian-grown seedlings made by Mr. E. W. Outerbridge in January did not arrive in Montreal in good condition, and the loss incurred to the shipper was considerable. I was not in Canada at the time, but on my arrival in February I investigated the circumstances as thoroughly as possible. From information received from the two Maritime brokers, it appears that shipments made to Halifax and Saint John by the same grower at the same time arrived in fairly good marketable condition, and no unusual deterioration was noticed in a few crates held in cold storage for two weeks, which indicated that the trouble was brought on, or at least aggravated, in transit between the Maritimes and Montreal. The first shipment to Montreal went forward by the Lady Drake on 14th January, and arrived in Saint John on the afternoon of 17th. It was loaded into a C. N. S. refrigerated car the same afternoon, and arrived at the Point St. Charles hold track, Montreal, on Friday afternoon, 20th. On Saturday, 21st, a representative of the Fruit Importers, Ltd., inspected the car, which on the surface appeared in good condition, and a sale price of $3.75 was agreed upon between this firm and Mutual Brokers. Since it was too late for the week-end market, the car was closed up, and the vents and plugs opened. The temperature at the top of the load was 42° F. and at the bottom 39° F., while the outside temperature was 38° F. The car was brought over to the terminal on 23rd, and was there unloaded on to the sales floor of the Fruit Importers, Ltd. As soon as the unloading was commenced it was noticed that though the tops were in good condition, the stems showed considerable decay, and it was apparent that the decay was spreading rapidly through the entire load. The Fruit Importers called the sale off, with the result that the nett sale was much lower than first anticipated.

As to the cause of the trouble, undoubtedly the underlying cause was "pink rot" (*Sclerotinia sclerotiorum*). The Mutual Brokers' inspection report conveyed unmistakeable evidence of symptoms consistent with that of "pink rot", and two Canadian Government Fruit Inspectors, who inspected the shipment definitely diagnosed the trouble as such. I am of opinion, however, that the trouble was aggravated by the favourable conditions afforded for the spread of the disease during transportation between Saint John and Montreal. Undoubtedly, the Canadian National Railways provided the usual facilities for this service, but apparently they did not prove suitable for Bermuda celery. During the early part of the Bermuda celery shipping season the temperature in Canada often drops to

below zero, and to guard against freezing condition in the cars, heaters are lighted when the outside temperature reaches 5 degrees above zero. It is this heat, I consider, that caused trouble in the celery. The humid atmosphere diffused by the heaters created favourable conditions for the growth and spread of the fungus *Sclerotinia sclerotiorum*. To offset this, it has been suggested to me that the use of hay insulation between false floors on the bottom of the car and a layer of hay six inches thick packed tightly between the sides and the outside crate would afford sufficient protection against low temperatures, without the use of heaters, and thus eliminate conditions favourable for fungal growth.

Delayed Account Sales. Considerable complaint has been made by farmers and shippers regarding the inconvenience caused by delayed account sales. The brokers have done everything possible to facilitate prompt returns, but they found themselves tied up, not through inability to collect promptly from their clients, but through being overburdened with overshipments which could not be paid for until a market was found for them. In fairness to the brokers, it is pointed out that they often advanced to the shippers considerable sums against freight, cartage and storage charges on unsold overshipments, which often could not be recovered for several weeks.

It would be an easy matter for any of the brokers to remit promptly if they disposed of the produce shipped to them without regard to the price and the demoralising effect a low price would have on orderly marketing. For instance, all through this season the shipments of carrots to the Maritimes were far in excess of their immediate consuming capacity; the brokers' selling price was $1.50 to $1.75; had they dumped their surplus on the market, the selling price for the entire consignment would probably have been halved. Another instance where account sales were delayed for the benefit of all concerned was in respect to early shipments of carrots to Montreal. New American bunched carrots were then selling cheaply, old domestic carrots were plentiful and cheap; consequently, the free selling price of Bermuda carrots in Montreal was far below that of the Martitimes. Had the brokers considered only themselves, they would have disposed of these shipments immediately at the fair market value at the time, which would have had the effect of forcing the Maritime price to a much lower level. Instead of doing this, they put the carrots in storage and sold them out in small quantities without detriment to the Maritime market.

Grading and Packing. Under the conditions which prevailed this season, that is, low prices combined with poor quality of vegetables, especially onions, and to a lesser extent, cabbage and carrots, the advantage of Government packing with respect to these vegetables was not so striking as in the previous year. Unfortunately, much of the vegetables shipped this season, particularly onions, were of very poor quality, and it was unfortunate that they should have been shipped at all. On the other hand, Government-packed tomatoes and potatoes were a distinct success. A noticeable feature with respect to the grading and packing of farm-packed produce is the improvement which has taken place during the last three years. This is particularly true of tomatoes, and to a lesser extent, of all other vegetables shipped except celery. Undoubtedly the improvement in farm pack has been brought about by the high standard set by Government pack.

Advertising. Special efforts were made to put over an affective advertising campaign in Saint John, Moncton and Halifax. On my return to Bermuda at the end of March, the Board authorised an expenditure of one hundred pounds in advertising in the Maritimes. On my return to

Saint John I arranged meetings with the Saint John and Moncton jobbers to discuss a co-operative advertising programme, which resulted in the jobbers agreeing to contribute to an advertising pool one half of one per cent of their gross purchases, the Department contributing the other half. Following this, agreements were entered into with the Saint John Telegraph-Journal and Times-Globe, and the Moncton Transcript to display weekly advertisements during April, May and June. Other advertising features were three minute daily broadcasts on the radio, displays of window cards and specially printed wrappers for washed celery. In Halifax newspaper advertising was carried out under the supervision of Mr. B. A. Blakeney on behalf of the jobbers, the Department contributing to the fund to the extent of one hundred dollars.

Appreciation. To the representative brokers I wish to record my appreciation for their co-operation and assistance at all times. I received invaluable advice and assistance from Mr. Crawford R. Johnson, Manager of Canada Cold Storage Co., Montreal, and the concessions on storage rates that he granted me from time to time were very generous and of material benefit to the shippers. Mr. H. C. Collier, Secretary of Canadian-West Indian League, afforded me valuable assistance, and was persistent in his efforts to promote trade and travel between Canada and Bermuda. The management of the Canadian National Steamships and their staff in Canada were ever willing to co-operate, with the result that many difficulties which might otherwise have been a source of annoyance were overcome.

Respectfully submitted,

W. R. EVANS,

Agricultural Assistant.

Pembroke, Bermuda,
5th January, 1934.

Report of The Horticulturist, 1933.

Director of Agriculture,

I have the honour to submit my report for the year 1933.

Station Grounds. General maintenance was good, though adverse weather conditions during January and early February tended to lower the standard. Many of the more exposed plantings were completely defoliated, causing a rather unsightly appearance for several months. During spring and summer, flower-beds and shrubbery borders were planted out with seasonable annuals. Lawns and hedge rows were kept well trimmed.

Plant Houses. The overcrowded housing condition of young plants last year was relieved by the erection, on the site of the old Egg Laying enclosure, of a new slat-house, measuring 60 feet by 50 feet and from 7 feet to 14 feet in height.

The other houses were kept fully stocked with young plants. The necessary frequent moving of these plants prevented any permanent decorative arrangements; however, a presentable condition was maintained. Potting, watering and general routine work were satisfactorily carried out.

Nursery. Bulb experiments were continued at the southern end of the Rosebank nursery plot. Though no definite results are yet forthcoming, the plants under trial showed good promise. The major portion of Hibiscus and other shrubs planted out last year were disposed of, and several new batches were planted in their stead.

Orchard. A very poor crop of fruits was gathered this year. This was in part due to the adverse weather conditions to which the trees were subjected during the early part of the year.

Propagation. The curtailment of plant propagation, as last year, was practised again, and resulted in a decided decrease in available planting material. Only such plants considered useful in future development and Arbor Society work were propagated. The current year's harvested annual flower seed were imported and sown, and, although the seeds were received approximately six weeks later than usual, the higher percentage of germination and increased vigour of the seedlings more than compensated for the later sowing.

Labelling. The majority of plants in the collection were labelled during the year. It was considered advisable and more economical to use zinc labels, in place of lead ones for transient plantings.

Prison Labour. Prison labour was employed to widen certain stretches of roadway in the vicinity of the Packing House, and in the preparation of a new roadway to the Slat-houses.

Noteworthy Plants. Several plants of the rare endigenous fern, *Diplazium Laffanianum* (Baker) Chistensen, commonly known as Governor Laffan's fern, were raised from spores. This fern cannot now be found in the wild state.

Spathodea campanulata, a very beautiful ornamental flowering tree, bloomed for the first time at the Station, and, incidentally, for the first time on record in the Colony.

Plant Distribution. In addition to plants sold, numerous contributions were made to local horticultural organisations, bazaars, etc. Several

hundred packets of tree and shrub trees were distributed gratis. Only such plants as were not stocked by local florists and nurserymen were sold by the Department.

Seed and Plant Exchange. The Department is greatly indebted to the Directors and Superintendents of the undermentioned institutions and private contributors, for their generous donations of seeds and plants:

Royal Botanic Gardens, Kew, England.

Queensland Forestry Department, Australia.

Melbourne Botanic Gardens, Australia.

U. S. Department of Agriculture, Washington, D.C.

Prof. Juan Balme, Mexico.

Many other horticultural institutions sent in seed exchange lists, but advantage could not be taken of their kind offers.

Landscaping. This phase of my work was considerably increased. Advice and assistance were given on numerous occasions to property owners in the various parishes. It would seem that a well organised landscaping service would be of great benefit to the community. Not only would it enhance the floral aspect of the island, but would do much to prevent the indiscriminate and ruthless cutting down of trees and hedges observed to be taking place in some new residential sections.

Garden Clubs. Secretarial work of the Garden Club of Bermuda was continued at His Excellency's pleasure. A re-organising of the Club's programme did much to revive the members' interest, and was instrumental in gaining some thirty odd new members. Monthly flower exhibits, and a show during April, were of outstanding success. Other horticultural societies continued to do good work.

Publications and Office Work. Several short articles on "noteworthy plants" were sent to the local press.

The first of a series of articles under the title of "Trees and Plants of Bermuda" were prepared and submitted to the Canada-West Indies Magazine. Mr. E. G. Whitbread is collaborating with me in this work.

Reports were submitted monthly, and routine office work was given attention.

Respectfully submitted,

J. C. NAUEN,

Horticulturist.

22nd January, 1934.

Report of The Inspector of Produce, 1933.

The Director of Agriculture,

I have the honour to submit my report for the year 1933.

PACKING HOUSE INSPECTION OF EXPORT VEGETABLES.

Three Government Packing Houses were in operation during the season. No. 1 Packing House, situated at the Agricultural Station, was opened in December, 1932, for the packing of export vegetables. This House remained open throughout the season, closing on 11th July. No. 2 Packing House, erected in the Agricultural Station grounds during April, was opened on 29th May and utilised solely for the packing of tomatoes. This shed also was closed on 11th July. A Packing House, built at Southampton during the early part of 1933, was opened to farmers on 22nd April. Vegetables other than tomatoes were received until 27th June, when the shed was closed owing to the reduced quantities of vegetables delivered for packing.

Quantities Shipped. See Director's report.

Comments. The following comments are made on the vegetables delivered to the Government Packing Houses.

Beans were good.

Beets were fair. Transplanted beets were too large, with too much top and misshapen roots.

Carrots were, on the whole, good. Some were delivered too large and old, and some varieties were undesirable.

Onions. Owing to too early planting and unfavourable weather, onions generally were received in a bad condition. Blight was prevalent, and a large percentage were rotten. Some lots were rejected as unfit for shipment.

Parsley was good.

Cucumbers were generally good. Many lots contained a number which were overgrown and "corky."

Cabbage. The quality was good. Most of the cabbage culled was on account of soft heads, due to premature harvesting.

Tomatoes were generally received in good condition. Some lots were injured by worms, and needed more preliminary culling on the farms.

Potatoes. The quality of Triumphs was slightly below average. Garnets were good. Large deliveries of Cobblers were received in varied condition; in some cases the tubers were very scabby, and "black-eye" rot was prevalent.

Other Vegetables. Sweet potatoes, kohl rabi, spinach and lettuce were received in small quantities. These vegetables were in good condition.

Quantities of Crates on Hand. At the close of the season, crate material on hand was sufficient to make up (approximately) :

15,000 bushel crates
600 two-bushel crates
18,000 tomato crates.

Crate material was imported by the Department, for use in the Packing Houses, throughout the season. The Packing House staff was utilised, btween packing days, to assemble and label crates. Sufficient quantity was kept on hand to provide for heavy deliveries, and the supply of made-up crates in the Packing House was always found adequate for the largest shipments. At no time did this reserve drop below 1,500 made-up crates.

DOCK INSPECTION OF EXPORT VEGETABLES.

Mr. C. V. S. Early, Assistant Inspector of Produce, was on duty at the dock from 1st January to 30th June.

Comments. The following comments are made on vegetables brought direct to the dock.

On farm-packed vegetables to New York.

Potatoes. Triumphs and Garnets were a moderate crop, the quality was fair. Very little disease was noticed. Cobblers were shipped in excellent condition. Only a small quantiy of the entire shipments was farm-packed.

Kale. During the early part of the season kale was injured by heavy winds. Later it was brought in fair condition. Some consignments were overgrown and worm-eaten.

Celery. Only a small quantity was shipped. Condition was moderate.

Other Vegetables. A small consignment of onions was the only other vegetable shipped farm-packed.

On farm-packed vegetables to Canada.

Carrots were shipped in fair condition. Grading was generally poor.

Celery. A small crop of celery was shipped. Unfavourable weather conditions were responsible for great variation in the crop. Blight, black-heart and rust were prevalent in a large proportion, and many lots were over-ripe. The general condition was much below average with the exception of a few isolated deliveries.

Onions were very poor, due to bad weather conditions.

Cabbage was of varied quality. Some lots were worm-eaten, and others were harvested too early.

Tomatoes were good. Grading was generally poor, and insufficient attention was paid to uniformity of pack.

Other Vegetables. Spinach, parsley and beans were shipped in small quantities. All were in good condition. A few consignments of beets were received of only moderate quality.

Produce Rejected (Farm-Packed). The following produce was rejected on first inspection. Some was re-packed and later passed for shipment.

Beets	10	crates
Cabbage	40	"
Carrots	210	"
Celery	420	"
Onions	563	
Potatoes	610	barrels
Tomatoes	412	crates
Kale	206	"
Spinach	14	"
Total	2,485	packages

This represents 6.9 per cent of the farm-packed vegetables brought to the dock.

Appeals. On 22nd May Mr. C. V. S. Early, Assistant Inspector of Produce, condemned 60 crates of celery. The grower, who was bringing in 60 crates the following day, requested the Director that I should be present on the dock to inspect this further consignment. His request was allowed, and I attended the dock on 23rd May. Finding this second consignment in my opinion, unfit for shipment, I rejected it. The grower was dissatisfied with my ruling, so under the provisions of the Agriculture Act three referees were appointed. By their decision the celery was passed for shipment.

Quantities of Produce Shipped. See Director's report.

Prosecutions. Nil.

Supervision of Chill-Rooms. Throughout the season the chillrooms of the steamers were frequently inspected by Assistant Inspector C. V. S. Early, Sub-Inspector J. W. M. Gibbons or myself. Stowage was at all times carefully watched, and I have the satisfaction of reporting that the breakage of crates was slight in proportion to the amount of produce shipped, and the short time available for loading.

Acknowledgment. I wish to record my appreciation of the assistance of the wharfingers, the dock pursers and officers of the different steamship companies engaged in the carrying of crops. I also wish to thank the Foreman and staff of Messrs. Pearman, Watlington and Company's cold storage plant, who expediently and efficiently handled all produce stored in their chill-rooms.

SEED POTATOES IMPORTED.

From Canada: Triumphs; 1,315 barrels; Garnets, 257 barrels, and 281 bags; Irish Cobblers; 1,202 barrels and 50 bags; Green Mountains, 10 barrels. All varieties were in good condition and well graded.

From Long Island, U.S.A.: Triumphs, 2,263 barrels. These potatoes were in sound condition, but poorly graded.

CRATE MATERIAL AND COOPERAGE IMPORTED.

Crate material was inspected on arrival. All was found in good condition. Barrel material was found to be of good quality.

LILY FIELD INSPECTION.

See Plant Pathologist's report.

PACKING HOUSE INSPECTION OF LILY BULBS.

Bulbs were in good condition. Considerably less bulbs were packed. "Blind" bulbs and basal rot were in evidence. Two thousand fourteen (2,014) cases were inspected and passed for export.

FARMERS' MARKET.

Five stalls have been rented from the beginning of the year, and the sixth was occupied from 25th March. A large variety of produce of good quality has been offered throughout the year. Prices, in comparison with outside trade, have been reasonable.

Appeals. On 22nd May Mr. C. V. S. Early, Assistant Inspector of Produce, condemned 60 crates of celery. The grower, who was bringing in 60 crates the following day, requested the Director that I should be present on the dock to inspect this further consignment. His request was allowed, and I attended the dock on 23rd May. Finding this second consignment, in my opinion, unfit for shipment, I rejected it. The grower was dissatisfied with my ruling, so under the provisions of the Agriculture Act three referees were appointed. By their decision the celery was passed for shipment.

RECOMMENDATIONS

(i) That all export vegetables delivered to the Government Packing Houses should be strictly inspected before inward receipts are issued.

(ii) That potatoes showing late blight (black-eye) should not be accepted in any circumstances.

(iii) That a man be placed at the dock to receive all Government-packed produce.

OTHER WORK.

I made four surveys during the crop season, and duly reported on the same. At the close of the vegetable packing season I attended to the laying up and lubricating of all grading machinery. Periodic visits were paid to the three Packing Houses throughout the summer. I met all incoming steamers from early August to the close of the year to ensure that regulations under the Control of Plant Diseases and Pests were observed.

Respectfully submitted,

T. ARTHUR HOLLIS,

Inspector of Produce.

Shelly Bay,

1st January, 1933.

Report of The Government Veterinary Officer, 1933.

The Director of Agriculture,

I have the honour to submit my report for the year 1933.

Local Outbreaks of Infectious Diseases. During the months of October, November and the first part of December, there was a slight outbreak of distemper in dogs. The percentage of mortality was low. Two cases of *Purpura hemorrhagica* occurred in November and December; one in Southampton and one in Pembroke; both horses had been recently imported from the United States. The one in Southampton recovered, and the one in Pembroke died. In January Mr. J. Repose Moniz, Smiths, notified me that he had lost several pigs which had died suddenly, and nearly all the remainder were sick. I found them to be suffering from septic poisoning, caused from being fed swill from an hotel. Those not fed swill were not sick. I, therefore, recommended to the Board steps be taken to control this practice. This was referred to by the Board of Health, and bye-laws are now before the Legislature.

Importation of Animals. The following domestic live stock were imported:

		Compared with last year	
Horses	74	decrease of	10
Dairy cattle	60	" "	19
Pigs	64	increase of	8
Poultry, mostly baby chicks	5,758	" "	758
Dogs	218	" "	20
Miscellaneous	397		

All imported pigs were vaccinated against hog cholera. All other animals not accompanied by proper certificates were treated in accordance with the requirements of the Board's Bye-Laws.

Visits of Inspection. During the year I made 269 visits of inspection to animal quarters on vessels, and 348 visits to various parts of the Islands to inspect coolers, inoculate animals in relation to licenses to sell milk, and also for the purpose of making agglutination tests for contagious abortion in cattle. This is the first year in which this test has been made in Bermuda. Of 1,218 cattle tested for tuberculosis, 15 reacted to the test, or 1.23 per cent, and were destroyed according to the Board's Bye-Laws. Two carcases slaughtered were found to be affected on examination by Board of Health Inspectors, and were destroyed.

I wish to say, in connection with the tuberculosis testing, that the owners of cattle were very willing to have their animals tested, as they now see the advantage of it. The number tested was nearly the total of the cattle in Bermuda, there being only about 100 which were not tested, and which I hope to include in the 1934 tests.

Of 31 cattle submitted to the agglutination test, 12 reacted. I am greatly interested in trying to eradicate this dread disease, and I recommend that this test should be compulsory for all cattle imported, and that they should be accompanied by certificates to that effect, the same as for tuberculosis. The agglutination test is compulsory in many other countries, even for internal shipments.

Condition of Dairy Stock. The general condition of and breeding of dairy cattle is improved both in the large dairies, and also the smaller ones and privately owned. Scrub bulls still remain.

Farmers' Market. The market was visited weekly. The general condition of the stalls was much improved. The quality of beef was fair on the whole and improved during the last two or three months of the year. Pork continued to be of good quality. The premises on which animals are slaughtered for sale on the market were in a sanitary condition.

Private Markets. The coolers of the various private markets were inspected frequently, and conditions on the whole were satisfactory. That of the Goody Shoppe has been extensively enlarged and improved.

Agricultural Exhibition. The exhibit of horses at the Fourteenth Annual Agricultural Exhibition was fair, also of cattle. Poultry was not so good as the year previous. Dogs were very good.

Issue of Pharmaceutical Material. No material was issued during the year.

Cruelty to Animal Cases. Professional evidence was given in 14 cases prosecuted by the Police Department.

Fees. The following fees, approved by the Board of Health on 10th March, 1931, were charged for services performed in my official capacity.

(a) Tuberculin tests of imported cows:

1 cow forty shillings. 2 cows sixty shillings. 3 cows seventy shillings. more than 3 cows ten shillings each additional.	of same owner.

(b) Ophthalmic test of imported horses:

1 horse twenty shillings. 2 horses thirty shillings. more than 2 horses five shillings each additional.	of same owner.

(c) Anti-hog cholera vaccination of imported pigs:

Initial fee of ten shillings, and one shilling and six pence per pig.

Over twenty pigs of same owner—no initial fee charged.

Respectfully submitted,

C. J. COOPER, V.S.,

Government Veterinary Officer.

Kelton, Pembroke,
8th January, 1934.

APPENDIX A

EXPORTS OF VEGETABLES (IN BUSHELS) AND BULBS (IN CASES) DURING THE TWENTY-YEAR PERIOD, 1914 TO 1933.

Year	Beets	Cabbage	Carrots	Celery	Kale	Onions	Parsley	Potatoes	Tomatoes	Veg. n.o.p.	Total vegetables	Bulbs
1914	23,464	—	31,228	19,389	3,465	87,455	62,814	114,642	—	36,727	379,184	941
1915	29,987	756	48,767	26,177	6,381	**153,030**	58,373	127,603	—	23,012	474,086	881
1916	**55,582**	212	62,349	45,161	3,110	148,221	75,735	159,965	—	33,499	583,384	1,224
1917	38,316	1,842	48,670	22,166	16,585	132,358	65,409	201,685	198	26,412	553,641	1,009
1918	11,431	—	20,730	13,460	2,496	133,141	11,570	**216,421**	—	6,111	415,360	823
1919	17,514	30	48,909	28,713	3,315	131,271	44,228	132,256	484	13,649	420,369	664
1920	35,123	19	92,736	21,237	17,021	109,072	**90,285**	156,464	—	14,870	536,827	749
1921	31,845	—	**115,278**	31,979	23,311	49,441	64,514	157,476	161	8,748	482,753	936
1922	21,947	—	76,348	28,403	12,397	70,874	46,267	116,403	—	6,443	379,082	1,604
1923	28,007	279	60,874	40,302	16,302	35,176	40,688	89,611	1,024	6,478	318,741	3,116
1924	28,984	267	88,745	67,191	28,053	41,848	56,346	94,011	1,048	10,111	416,604	3,539
1925	18,263	—	62,620	41,210	26,118	21,570	56,579	62,635	624	11,478	301,097	4,040
1926	18,075	—	68,996	74,572	28,599	39,336	82,881	91,933	3,081	7,931	415,404	4,524
1927	11,366	—	44,833	109,302	23,319	19,930	55,619	96,192	5,396	3,759	369,716	5,943
1928	15,580	—	42,250	129,266	41,481	16,063	60,318	110,136	1,584	4,124	420,802	**7,611**
1929	1,225	1,188	19,337	155,894	24,156	4,055	32,148	97,874	8,051	1,997	345,925	5,864
1930	489	2,061	19,255	113,080	14,220	10,737	11,431	65,953	6,581	1,782	245,559	5,508
1931	620	5,109	10,956	46,510	11,199	3,412	378	38,435	4,900	234	121,753	4,270
1932	1,369	**11,994**	17,899	49,004	14,544	29,412	1,196	35,925	**10,241**	1,234	172,818	3,009
1933	1,237	12,896	26,005	19,846	9,294	22,483	664	44,588	13,852	2,877	153,742	2,014

Note. Earlier shipments of cabbage and tomatoes were relatively small, and were generally included in "Vegetables, n.o.p."

Earlier shipments of celery were in crates of varying sizes, and the quantities shown (in bushels) are approxmate only.

In the earlier years relatively large quantities of lettuce were exported. As this vegetables is now of little value for export, quantities shipped are included in "Vegetables, n.o.p."

The largest shipment of each vegetable and of bulbs, within the period, is shown in black-faced type.

APPENDIX B

REPORT ON THE BERMUDA BULB TRADE IN GREAT BRITAIN, 1933.

We are pleased to report that the sales in the past season show a satisfactory increase over those of the two previous seasons, and were not far short of 1930. This confirms our view that the setback in 1931 and 1932 was attributable to the general depression; and it is gratifying to see signs of recovery, now that improved financial conditions have relieved the trade of its most pressing troubles. In many ways the Horticultural trade has adapted itself smoothly to the changed conditions following the introduction of the Import Tariff. In the case of lily bulbs, the duty preference would hardly have been sufficient to make very much difference, if unaccompanied by other factors. Of these, unquestionably the greatest has been the good reputation which Bermuda produce has earned for itself in recent years; and the second is the strong sentiment among the public in favour of buying Empire goods. Some progress has been made also in selling to such European countries as are in a position to trade. Notably, Harrisii have for the first time been introduced into Sweden; and, if successful, there is a prospect of regular orders.

The least satisfactory feature of the season was the somewhat heavy reduction in prices. For reasons which are well understood, it is impossible for a country like Bermuda to produce bulbs as cheaply as Japan. Consequently, it has been our aim to attract regular customers who are more particular about reliable quality than about obtaining the lowest price. In the past, Japanese prices varied greatly from year to year; but in the last three years they have been consistently at a very low level, resulting in an unfortunate impression that all Longiflorum ought to be cheap. For this reason, it was impossible to allow the difference in price to become too wide; and there was no alternative to a reduction, if the trade in Bermuda was to be maintained. As we hoped would be the case, the lower prices not only preserved the existing connection, but also attracted new business.

The 1933 shipments look to be of first-rate quality. In this connection, we may add that the 1932 bulbs turned out well, and customers were satisfied.

A few years ago, we drew attention to the grading. It is true that some of the complaints were exaggerated, but, in our opinion, there was room for improvement. We are now pleased to say that there is evidence of much more care, and it is now rare to receive any complaint about inaccuracy in the sizes.

The only point really calling for adverse criticism is concerned with some of the boxes. From some shippers, they were uniformly strong, and tightly fastened; but from certain others they were by no means satisfactory. Sand has been the standard packing for a very long time, and it has many merits, but it is obvious that it is the very worst packing imaginable unless steps are taken to prevent its leaking from around the bulbs it is intended to protect. We were, therefore, much concerned to discover on the arrival of some of the shipments that the boards of a considerable number of boxes had worked loose on the nails, and the bulbs were quite loose inside. Fortunately, the damage was less than it might have been; but it seems very unwise to risk the loss of otherwise good produce for lack of a little precaution. So far as we could judge, the trouble was the result of using smooth new nails in a particular kind of wood. Probably it could be prevented entirely by using a rough nail, or by rusting the nails before use.

Most of the shipments came by the direct Bermuda—Liverpool route. Some of these were stowed "on deck." Whether this is wise is doubtful; but, on this occasion, no harm resulted. This year the dates of sailings fitted very well for the early shippers, but the second deliveries were a little late.

The displays of Bermuda lilies (like most other plants) were affected by the exceptional weather conditions. Those shown at Kew were under glass and did not suffer, but the Hyde Park plants were hardly so good as in some other years. The batch of plants intended for the Lily Conference were a failure, inasmuch as they flowered a week too early. This was much regretted, but we are satisfied that everything possible was done to keep them back. In any case, the date of the Conference was late for Harrisii, but we feel sure that it could have been managed, if only we had been favoured with reasonable luck in the weather.

The Conference itself was a great success. Bermuda lilies received considerable mention, particularly in the scientific discussions in which both Mr. Ogilvie and Mr. Russell took a prominent share.

We would like to include in our report a few words of appreciation of the generous help given by Mr. Lawrence Ogilvie. The work he did while in Bermuda is universally known; but it may not be generally realised that he has done a very great deal to further the interests of Bermuda lilies since his return to England. Seeing that certain diseases and troubles, some of a very obscure nature, arise after bulbs are in the hands of customers, it is of the utmost help to have the advice and guidance of a recognised authority on these subjects. We feel sure all concerned in the trade will join us in hoping that Mr. Ogilvie will long be able to continue his kindly interest in Bermuda lilies.

At the end of August, a meeting of the Royal Horticultural Society was devoted to a display of bulbs. While primarily intended to encourage the production of daffodils, etc. in this country, no objection was taken to the inclusion of Bermuda lilies. A stand was accordingly taken in the name of your Department, and a representative collection of Harrisii was staged.

It was a great pleasure to see Mr. Russell again, and he gave us much interesting information. We hope that his insight into the state of the trade here will be of assistance in considering our future problems.

ROBERT TUCKER & CO.

London,
28th November, 1933.

APPENDIX C

DISPOSAL OF PRODUCE, 1933

Milk to King Edward VII Memorial Hospital	£ 89	17	0
Vegetables to Hospital and other institutions	11	6	0
Total	£101	3	0

N.B. Most vegetables were shipped to Canada, experimentally chiefly.

APPENDIX D

RAINFALL RECORDED AT AGRICULTURAL STATION, 1933.

January	7.44	inches
February	3.38	"
March	2.57	"
April	5.46	"
May	2.67	"
June	2.47	"
July	2.61	"
August	4.25	"
September	4.15	"
October	2.96	"
November	4.56	"
December	3.70	"
Total	46.22	inches

RAINFALL FOR LAST FIVE YEARS.

1928	73.72	inches
1929	60.62	"
1930	59.20	
1931	50.67	
1932	53.32	"

C. V. S. EARLY,

Station Foreman.

27th January, 1934.

APPENDIX E

FINANCIAL STATEMENTS

(a) EXPENDITURE (EXCUSIVE OF SALARIES) FOR THE YEAR ENDED 31ST DECEMBER, 1933

PERSONAL EMOLUMENTS

Fees to Members of Board

Appropriated by Act No. 38 of 1932		£ 70 0 0
Paid to members for attendance	£ 49 12 0	
Unexpended balance	20 8 0	
	£ 70 0 0	£ 70 0 0

Rent Allowance to Plant Pathologist

Appropriated by Act No. 38 of 1932		£100 0 0
Paid to Plant Pathologist	£100 0 0	
	£100 0 0	£100 0 0

ASSISTANT INSPECTOR OF PRODUCE.

Appropriated by Act No. 38 of 1932				£200	0	0
Paid in monthly wages	£175	0	0			
Unexpended balance	25	0	0			
	£200	0	0	£200	0	0

SUB-INSPECTORS OF PRODUCE.

Appropriated by Act No. 38 of 1932				£500	0	0
Paid in daily wages	£468	18	0			
Unexpended balance	31	2	0			
	£500	0	0	£500	0	0

OTHER CHARGES

GENERAL GRANT

Appropriated by Act No. 38 of 1932				£2,000	0	0
Labour on experimental plots, lawns, flower beds, glasshouses and drives, and care of live stock	£1,422	15	0			
Prison labour	13	19	0			
Cartage and ploughing	112	19	6			
Manure and fertilisers	10	15	6			
Seed potatoes, and other seeds	68	18	11			
Live stock—feed, bedding and incidentals	130	1	7			
Repairs and renewal of buildings, tools, etc	68	16	3			
Spare parts and materials for Rototiller	58	8	5			
Stationery and other office supplies and printing	103	4	3			
Subscriptions to agricultural periodicals and purchase of books	4	8	6			
Unexpended balance	5	13	1			
	£2,000	0	0	£2,000	0	0

INSPECTION SERVICES, MARKET INVESTIGATIONS AND CONTINGENCIES.

Appropriated by Act No. 38 of 1932				£1,000	0	0
Inspection of vegetables at dock and at Packing Houses	£ 129	5	6			
Representation in Canada	363	14	1			
Advertising in Canada	112	14	9			
Advertising lily bulbs in England, including cost of bulbs and fee to representative	118	10	7			
Inspection of seed potatoes on Long Island	31	4	4			
Representation at Canadian Vegetable Jobbers' Convention	66	19	3			
Insurance of Packing Houses	33	12	0			
Printing	26	6	5			
Inspectors' badges, and other supplies	10	6	10			
Cables	84	13	0			
Subscriptions to marketing periodicals	7	0	1			
Unexpended balance	15	13	2			
	£1,000	0	0	£1,000	0	0

Eradication of Animal Diseases.

Appropriated by Act No. 38 of 1932		£ 75 0 0
" " Resolve No. 12 of 1933		30 0 0
Compensation to owners of condemned stock	£ 97 0 0	
Fees to Appraisal Committee	6 8 0	
Supplies and contingencies	1 10 5	
Unexpended balance	... 1 7	
	£105 0 0	£105 0 0

Note. This appropriation was inadequate, and the sum of £23 was asked for at the close of the year.

Control of Plant Diseases and Pests.

Appropriated by Act No. 38 of 1932		£150 0 0
Labour	£ 38 15 4	
Fungicides and insecticides	20 14 11	
Gasoline and oil	31 4 10	
Equipment	45 14 2	
Subscriptions to pathological periodicals	10 6 11	
Unexpended balance	3 3 10	
	£150 0 0	£150 0 0

Horticulture.

Appropriated by Act No. 38 of 1932		£150 0 0
Labour	£ 25 1 3	
Erection of slat-house	72 8 2	
Repairs to mower	10 2 11	
Seeds, plants and bulbs	28 10 2	
Subscriptions to horticultural periodicals	2 14 0	
Printing	10 4 4	
Unexpended balance	... 19 2	
	£150 0 0	£150 0 0

Improvement of Live Stock.

Appropriated by Act No. 38 of 1932		£100 0 0
Animals purchased	£ 90 3 8	
Registration of animals	1 10 2	
Supplies and contingencies	5 17 10	
Unexpended balance	2 8 4	
	£100 0 0	£100 0 0

Departmental Contingencies, Travelling Expenses, Telephones, Lighting, Etc.

Appropriated by Act No. 38 of 1932							£120	0 0
Local travelling expenses				£	12	13 3		
Stationery and printing					64	5 7		
Foreign postage					6	17 6		
Lighting and power					13	18 0		
Telephones					22	4 0		
Unexpended balance					...	1 8		
				£120	0	0	£120	0 0

Packing House, Services and Contingencies.

Appropriated by Act No. 38 of 1932							£4,500	0 0
" " Resolve No. 5 of 1933							350	0 0
" " " " 12 "							1,445	0 0
New buildings, including labour and material				£669	11	1		
New machinery and incidentals				606	17	9		
Packing supplies: Nails	£	96	4 0					
Labels		196	9 3					
Liners		19	10 0					
Paste		25	7 0	337	10	3		
Packing contingencies:								
Rubber stamps		11	8 9					
Printed forms		32	18 8					
Finger cots, etc		1	13 11	46	1	4		
Electric current				66	9	1		
Cold storage				198	7	11		
Labour; Pasting labels, making crates, grading, packing, etc				2,234	9	10		
Cartage of crated vegetables from:								
(a) Station Packing House		281	11 10					
(b) Southampton " "		502	12 8					
(c) Cold storage plant		37	10 0	821	14	6		
Rental of Southampton Packing House site				12	0	0		
Telephone at Southampton House				11	0	0		
Cables				21	14	8		
Advertising in Canada				22	5	8		
Rental of "B" store, Hamilton, for storage material				25	0	0		
Cartage and wharfage of crate material				207	15	9		
Crate material carried over				1,014	0	0		
Unexpended balance				...	2	2		
				£6,295	0	0	£6,295	0 0

ANNUAL AGRICULTURAL EXHIBITION.

Appropriated by Act No. 38 of 1932				£300	0	0
Labour, material and contengencies	£300	0	0			
	£300	0	0	£300	0	0

(b) REIMBURSEMENTS TO GOVERNMENT.

Sale of plants				£ 15	6	1
" " vegetables				152	10	5
" " live stock				36	11	0
Live stock fees				93	18	0
Veterinarian fees				7	19	0
Lily certificates				...	17	5
Spraying services				5	7	6
Rototiller services				30	5	3
Seedsmen's licenses				1	15	0
Unexpended balance of imprest for purchase of Exhibition medals				17	5	9
Packing House receipts:						
Packing House charges for packing	£1,574	9	0			
Profit on crates	36	2	6			
Charges on crates	233	0	5			
Cartage from Southampton	229	2	3	2,072	14	2
				£2,434	9	7

(c) FARMERS' MARKET.

Balance brought forward				£	2	10 11
Received for hire of stalls				72	0	0
Rental of market	£26	11	2			
Lighting	27	12	9			
Amount written off	20	7	0			
	£74	10	11	£ 74	10	11

HILDA C. LINES,

Clerk, Board of Agriculture.

18th January, 1934.

AGRICULTURAL STATION.

The Agricultural Station is within twenty minutes walk of Hamilton Post Office, and is situated in east Paget on Point Finger Road near the King Edward VII Memorial Hospital.

At the Station may be seen many trees, shrubs and other plants, the majority of which are labelled. Also vegetable experiment plots and pure-bred live stock.

The offices of the Department of Agriculture are situated at the Agricultural Station, and are open from 7 a.m. to 5 p.m., Sundays excepted.

The Annual Agricultural Exhibitions are held on the grounds of the Station.

GOVERNMENT PACKING HOUSES.

Two Government Packing Houses are situated at the Agricultural Station and one at Evans Bay Railway Station, Southampton. Persons who desire to inspect the Packing Houses are requested to first communicate with the Department (Telephone 2477) so that convenient times to visit may be arranged.

Visitors without permits from the Department are not welcomed at the Packing Houses, for such visitors often retard the work of grading and packing because of the crowded condition of the Packing Houses when packing is in progress.

FARMERS' MARKET, HAMILTON.

The Farmers' Market, Front Street, Hamilton, is under the supervision of the Department, and applications to sell therein should be made to the Inspector of Produce.

The Market is open from 8 a.m. to 5 p.m. (10 p.m. on Saturdays) on all days except Sundays and holidays.

INSPECTOR'S OFFICE.

The office of the Inspector of Produce is situated at No. 1 Shed (ground floor), Front Street, Hamilton.